OMEGA SMALL VOLUME GROUP

DRAFT QUALITY ASSURANCE PROJECT PLAN

OMEGA CHEMICAL OPERABLE UNIT 2, WHITTIER, CA

EPA Site ID#09BC
Docket No. 9-2004-004

ARCADIS
Infrastructure, buildings, environment, communications

ARCADIS

Infrastructure, buildings, environment, communications

ARCADIS G&M, Inc.
1400 No. Harbor Boulevard
Suite 700
Fullerton
California 92835-4127
Tel 714.278.0992
Fax 714.278.0051

BUSINESS UNIT

Transmittal Letter

To:
Mr. Christopher Lichens
United States Environmental Protection Agency
75 Hawthorne Street
Mailstop SFD-7-4
San Francisco, CA 94105

Copies:
Ken Fredianelli, Project Navigator, Ltd.
(1 copy)
Peter McGaw, Archer Norris, LLC
(1 copy)
Project File

From:
Ronald Halpern, R.G. R.H.

Date:
18 November 2004

Subject:
Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004

ARCADIS Project No.:
CA000646.0001.00001

We are sending you:
☒ **Attached** ☐ **Under Separate Cover Via ________ the Following Items:**

☐ Shop Drawings ☐ Plans ☐ Specifications ☐ Change Order
☐ Prints ☐ Samples ☐ Copy of Letter ☒ **Reports**
☐ Other:

Copies	Date	Drawing No.	Rev.	Description	Action*
3	11/16/04			Draft Quality Assurance Project Plan, Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004, prepared for Omega Small Volume Group	
3	11/18/04			Draft Field Sampling Plan, Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004, prepared for Omega Small Volume Group	

Action*
☐ A Approved ☐ CR Correct and Resubmit ☐ Resubmit _____ Copies
☐ AN Approved As Noted ☒ F **File** ☐ Return _____ Copies
☒ AS **As Requested** ☐ FA For Approval ☐ Review and Comment
☐ Other:

Mailing Method
☐ U.S. Postal Service 1st Class ☐ Courier/Hand Delivery ☒ **FedEx Priority Overnight** ☐ FedEx 2-Day Delivery
☐ Certified/Registered Mail ☐ United Postal Service (UPS) ☐ FedEx Standard Overnight ☐ FedEx Economy
☐ Other:

Comments:

g:\aproject\omega chemical\corresp-agency\trans-lichens 111804.doc

OMEGA SMALL VOLUME GROUP

DRAFT QUALITY ASSURANCE PROJECT PLAN

OMEGA CHEMICAL OPERABLE
UNIT 2, WHITTIER, CA

EPA Site ID#09BC
Docket No. 9-2004-004

ARCADIS

Infrastructure, buildings, environment, communications

ARCADIS

Draft Quality Assurance Project Plan

Omega Chemical Operable Unit 2, Whittier, CA

Ronald M. Halpern, RG
Project Scientist

Avram Frankel, PE
Principal Engineer

John Johnsen
Program Manager

Prepared for:
Omega Small Volume Group (OSVOG)

Prepared by:
ARCADIS G&M, Inc.
1400 North Harbor Boulevard
Suite 700
Fullerton
California 92835
Tel 714 278 0992
Fax 714 278 0051

Our Ref.:
CA000646.0001

Date:
November 16, 2004

Tables

Figures

Appendices

ARCADIS

Draft Quality Assurance Project Plan

Omega Chemical
Operable Unit 2,
Whittier, CA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION IX

Plan Title	Quality Assurance Project Plan Omega Chemical Superfund Site Operable Unit 2
Site Name:	Omega Chemical Superfund Site
Site Location:	Whittier
City/State/Zip:	Los Angeles County, California
Site EPA ID#:	09BC
Anticipated Sampling Dates	2004 to 2005
Prepared By:	Ronald Halpern, R.G.
Date:	November 16, 2004
Agency or Firm:	ARCADIS G&M, Inc.
Address:	1400 N. Harbor Blvd., Suite 700
City/State/Zip:	Fullerton, California 92835
Telephone:	714/278-0992
EPA Work Assignment Manager (WAM):	Christopher Lichens Section: SFD-7-4
Phone No.	415/972-3149
QAPP Approval Date:	______________________

Approved: John Johnsen ______________________ Date: ______________
ARCADIS Project Manager

Approved: Avram Frankel ______________________ Date: ______________
ARCADIS Quality Assurance Officer

Approved: Christopher Lichens ______________________ Date: ______________
EPA Work Assignment Manager (WAM)

Approved: David Taylor, Ph.D. ______________________ Date: ______________
EPA Quality Assurance Officer

Distribution List

____________________	EPA Region IX Work Assignment Manager
John Johnsen	ARCADIS Project Manager
Ronald Halpern	ARCADIS Field Team Leader
____________________	ARCADIS Field Team Leader
____________________	ARCADIS Quality Assurance Manager

Acronyms

CLP	Contract Laboratory Program
COC	Chain-of-Custody
DQO	Data Quality Objective
EPA	United States Environmental Protection Agency
Freon 11	Trichlorofluoromethane
Freon 113	Trichlorotrifluoroethane
FSP	Field Sampling Plan
HSP	Health and Safety Plan
IDW	Investigation-Derived Waste
LCS	Laboratory Quality Control Samples
LCSD	Laboratory Quality Control Samples Duplicate
LOE	Level of Effort
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
OSVOG	Omega Small Volume Group
OU	Operable Unit
PCE	Perchloroethene (tetrachloroethene)
PM	Project Manager
PRPs	Potentially Responsible Parties
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAT	Quality Assurance Team
RCRA	Resource Conservation and Recovery Act

RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
SOP	Standard Operating Procedure
SRM	Standard Reference Material
SSC	Site Safety Coordinator
TCE	Trichloroethene
TM	Task Manager
UAO	Unilateral Administrative Order
VOC	Volatile Organic Compound
WA	Work Assignment
WAM	Work Assignment Manager

1. Introduction

This Quality Assurance Project Plan (QAPP) follows United States Environmental Protection Agency (EPA) guidelines contained in *EPA Guidance for Quality Assurance Project Plans* (EPA, 2002b), and *EPA Requirements for Quality Assurance Project Plans* (EPA, 2001). Thus, the following section headings correlate with the subtitles found in the EPA guidelines.

- Project Management
- Data Generation and Acquisition
- Assessment and Oversight
- Data Validation and Usability

Portions of the text in this document were taken from CH2M Hill's Remedial Investigation/Feasibility Study (RI/FS) Work Plan and QAPP (CH2M Hill, 2004a and 2004b).

2. Project Management/Data Quality Objectives (DQOs)

2.1 Project Organization

This remedial investigation (RI) is being performed under contract to the Omega Small Volume Group (OSVOG), a group of potentially responsible parties (PRPs) charged with performing this work in the Omega Chemical Superfund Site Operable Unit 2 (OU-2). The RI is being conducted in accordance with the EPA's First Amended Unilateral Administrative Order (UAO) for Response Action (First Amended UAO, EPA Region IX, CERCLA Docket No. 9-2004-0004). OSVOG is being represented by Mr. Peter McGaw of the Law Offices of Archer Norris. Mr. Ken Fredianelli of Project Navigator, Ltd. will be the project coordinator (PC), communicating with EPA's Remedial Project Manager (EPA RPM), Mr. Christopher Lichens, Mr. McGaw, and ARCADIS' project manager (PM), Mr. John Johnsen.

ARCADIS' PM will manage the financial, schedule, and technical status of the work assignment (WA). Key people involved in interfacing with the PM are the PC, individual task managers (TM), and members of the quality assurance team (QAT) as shown on Figure 1.

The primary responsibility for project quality rests with the PM. Independent quality control (QC) is provided by the QAT. The QAT will review project planning documents, data evaluation, and deliverables. Outside organizations may be used to evaluate the quality of laboratory data.

The sampling team will implement the QAPP, field sampling plan (FSP), and health and safety plan (HSP). The site safety coordinator (SSC) is responsible for adherence to the HSP and field decontamination procedures. The entire field effort is directed by the field team leader (FTL).

The TM is responsible for procuring and interfacing with subcontractors. Subcontractors that will be utilized on this WA include underground utility locators, traffic control providers, drillers, chemical and physical analytical laboratories, surveyors, and waste disposal contractors, and laboratory data evaluators.

Where quality assurance (QA) problems or deficiencies requiring special action are uncovered, the PM, QAT, and quality assurance officer (QAO) will identify the appropriate corrective action to be initiated by the FTL or the laboratory.

Project organization and the line of authority for ARCADIS efforts are illustrated in Figure 1. Data users and recipients are shown in Figure 2. Both EPA and ARCADIS technical personnel and QA personnel are shown.

2.2 Problem Definition/Background

2.2.1 Purpose

This QAPP presents the policies, organizations, objectives, and functional activities/procedures associated with the RI sampling/analysis and construction activities at OU-2, and includes accompanying the DQOs, which can be found in Appendix A (EPA, 2000).

2.2.2 Problem Statement

Existing groundwater and soil data indicate that elevated concentrations of volatile organic compounds (VOCs) and other compounds are present in the soil and groundwater beneath the former Omega Chemical Facility (Operable Unit 1 [OU-1]) and up to 2 miles downgradient in shallow groundwater. A series of soil gas, soil, and groundwater investigations has been performed at OU-1 by a variety of consultants beginning in 1985. Chlorinated hydrocarbons (perchloroethene [PCE], trichloroethene [TCE], 1,1-dichloroethene, cis-1,2-dichloroethene, and chloroform) and chlorofluorocarbons (trichlorofluoromethane [Freon 11] and trichlorotrifluoroethane [Freon 113]) were identified as the primary chemicals of concern directly beneath the site. Elevated total chromium also was reported in groundwater beneath the Omega site. Elevated concentrations of chemicals of concern were also reported west and southwest of the Omega facility, suggesting that a downgradient migration of the contaminant plume from the site has occurred.

OU-2 generally includes the groundwater-contaminated areas encompassing the Omega Chemical Facility and extends approximately 2.2 miles to the southwest. The vadose zone contamination at the Omega site and the highly contaminated portion of the aquifer in the immediate site vicinity are addressed as OU-1 under a separate effort. The primary objective of this investigation is to conduct an RI to estimate the vertical and lateral extent of groundwater contamination within OU-2.

2.2.3 Background

The Omega Chemical Corporation (Omega) is a former refrigerant/solvent recycling operation located in Whittier, California, a community of approximately 85,000 people. The facility is located southwest and downgradient of a residential neighborhood, across Whittier Boulevard, and within 1 mile of several schools, including three elementary schools and two high schools (Figure 3). The facility operated as a Resource Conservation and Recovery Act (RCRA) solvent and refrigerant recycling and treatment facility from approximately 1976 to 1991, handling primarily chlorinated hydrocarbons and chlorofluorocarbons. Drums and bulk loads of waste solvents and chemicals from various industrial activities were sent to the Omega facility for processing to form commercial products. Chemical, thermal, and physical treatment processes were reportedly used to recycle the waste materials. Wastes generated from these treatment and recycling activities included distillation column (still) bottoms, aqueous fractions, and nonrecoverable solvents. Additional data regarding site history, past investigations, and remediation activities are discussed in detail in the Final On-Site Soils RI/FS Work Plan (Camp Dresser & McKee [CDM], 2003) and the Omega Chemical Superfund Site, Whittier, California; Phase 2 Groundwater Characterization Study Report (Weston Solutions, Inc. [Weston], 2003).

2.2.4 Data Needs and Uses

Data needs and uses for the objectives described in this section have been identified through the DQO process presented in Appendix A.

- What is the vertical and lateral extent of the contamination in groundwater beneath OU-2; what is the nature of contamination in groundwater beneath OU-2; and, what is the trend in groundwater concentration?
- Do contaminants pose an unacceptable potential risk to human health and the environment?
- Are emergent contaminants (1,4-dioxane, perchlorate, N-nitrosodimethylamine, hexavalent chromium, and 1,2,3-trichloropropane) present in groundwater beneath OU-2?
- Where and how will Investigative Derived Waste (IDW) be disposed of.

The data needs and uses are summarized in Table 1 at the end of this section. Table 1 lists the chemicals of concern and presents regulatory criteria/action level requirements for organics and inorganics. The table presents a listing of applicable regulations and identifies the lowest regulatory criteria where there are multiple regulatory criteria/action levels for a given analyte. Table 2 lists the analytical methods and laboratory reporting limits selected to meet these criteria.

2.3 Project Description and Schedule

2.3.1 Description of Work to be Performed

A summary of the work to be performed relating to sample collection, analysis, and interpretation is provided below.

2.3.1.1 Field Investigation

ARCADIS will conduct the RI field investigation at OU-2. Samples will include groundwater samples that will be analyzed for VOCs, for screening purposes. These samples will be collected during installation of the monitoring and extraction wells. Further; groundwater samples and associated field supplicates will be collected from the wells for monitoring purposes after installation of the wells is complete.

2.3.1.2 Sample Analysis

Sample analyses will be carried out by a laboratory accredited under the National Environmental Laboratory Accreditation Program (NELAP) with a documented Quality Assurance Program which complies with ANSI/ASQC E-4 1004, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Program" (American National Standard Institute, January 5, 1995) and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA, March 2001), or equivalent.

2.3.1.3 Analytical Support and Data Validation

All data for all parameters will undergo two levels of review and validation: (1) at the laboratory, and (2) outside the laboratory by ARCADIS personnel.

2.3.1.4 Data Evaluation

ARCADIS will organize and evaluate existing data and data gathered from this investigation. The data evaluation activities will include:

- Field QA/QC
- Data usability evaluation;
- Data reduction, tabulation, and evaluation; and
- Preparing a data evaluation report.

A brief data evaluation report will be prepared after completion of well installation and groundwater sampling. The data report will include a sampling location map and results tables for each medium sampled (in this case, just for groundwater).

Data usability and validation will consist of verifying the following:

- All field screening instruments (e.g., photoionization detector, pH/conductivity/temperature meter, turbidity meter) were calibrated according to their respective manufacturer's Operation and Maintenance manual. Calibration log sheets were appropriately completed and maintained in the file;
- Field and sample logs maintained and complete. Deviations from the FSP are noted in the logs;

- Samples were collected in appropriate method and placed in appropriate containers, using appropriate preservative, if any. Sample information (i.e., location, time, sampler name, matrix, preservative used, etc.) on sample label is correct;

- Appropriate field QC samples (field blanks, trip blanks, equipment blanks, duplicate samples) were collected as specified in the QAPP and FSP;

- Analytical methods requested for samples submitted for analysis were in accordance with the FSP;

- Documentation regarding sample receipt and tracking is complete;

- Analytical methods performed on the samples submitted was as requested;

- Sample holding times were within limits as specified in the QAPP and EPA publication SW-846, entitled, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1996), or other method references as applicable;

- Reporting limits were as specified in the QAPP;

- Appropriate calibration techniques and laboratory QC samples were prepared and analyzed (calibration standards, method blanks, duplicate samples, spiked samples, spiked blanks, interference check standards, etc.)

- Results of laboratory QC sample analysis were within acceptable limits;

The results and findings from data validation and data usability review will be summarized and incorporated into each data report.

2.3.1.5 Assessment of Risk

EPA will perform a baseline risk assessment using data collected by OSVOG as required in the UAO.

2.3.1.6 *RI Report*

ARCADIS will prepare a RI Report that describes the procedures implemented and results of the remedial investigation as dictated by the UAO. The report will include a site location map, well location map, groundwater contour map, and contaminant distribution maps for PCE, TCE, Freon 11, and Freon 113. Tables to be included in the report will include: well construction summary, well location and elevation survey data, and groundwater data (depth to water measurements, calculated elevation, and contaminant concentrations). Supporting documentation will consist of: computerized field boring logs, well construction logs, geophysical logs (if any), field equipment calibration worksheets, field groundwater monitoring forms, drum inventory forms, and copies of laboratory reports.

2.3.2 Schedule of Activities

The field investigation is expected to start in mid to late January 2005, and will end by mid-April 2005. A copy of the proposed schedule was included as Appendix B of the ARCADIS RI Work Plan (2004a).

2.4 DQOs

2.4.1 Project Quality Objectives

DQOs have been specified for each data collection activity, and the work will be conducted and documented so that the data collected are of sufficient quality for their intended use (EPA, 2000). DQOs specify the data type, quality, quantity, and uses needed to make decisions, and are the basis for designing data collection activities. The DQOs have been used to design the data collection activities presented in the FSP. Specific DQOs were considered independently through the DQO process (EPA, 1994a, 1994b, and 2000) to meet the data user's needs for each activity. Appendix A presents the DQO decision-making process for the remedial field activities.

2.4.2 Measurement Performance Criteria

The QA objective of this plan is provide data of known and appropriate quality for the needs identified in previous sections. Data quality is assessed using the following measurement performance criteria: representativeness, comparability, accuracy, precision, and completeness. These terms, the applicable procedures and level of effort (LOE) are described below.

The applicable QC procedures, quantitative targets, and LOE for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. Analytical parameters and applicable detection levels, analytical precision, accuracy, and completeness in alignment with the needs identified in Section 2.2.4 are presented in Table 2.

Reporting detection levels/target detection limits listed in Table 2 are per-method reporting limits, equivalent to contract-required detection levels. "Target" implies that final sample detection levels may be higher because of sample matrix effects or other issues. Detection levels for the individual samples will be reported in the final data. Laboratory-specific method detection limits (MDLs) are significantly below reporting levels. Where reporting limits are higher than regulatory limits, the project team will use MDLs as needed for project decisions.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the chemical compounds in the matrix samples. Representativeness of data collection is addressed by careful preparation of the sampling and analysis program. This QAPP, together with the FSP, addresses representativeness by specifying sufficient numbers and locations of samples; incorporating standard sampling methodologies; specifying sample collection techniques, sample preservation, and decontamination procedures; selecting laboratory methods to prepare and analyze water samples; and establishing field and laboratory QA/QC procedures. The proposed sampling and analysis documentation, discussed in subsequent sections of this document, will establish the extent to which protocols have been followed and sample identification and integrity ensured.

Comparability expresses the confidence with which one data set can be compared to another. The objective of comparability is to ensure that data developed during the investigation are comparable to existing site data and can address applicable criteria or standards established by the EPA. Data comparability will be maintained by specifying sampling and laboratory methods that are consistent with the current standards of practice as approved by the EPA. Field methods are discussed in the FSP. Proposed detection limits are listed in Table 2. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

Accuracy is an assessment of the closeness of the measured value to the true value. It is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systematic error. Accuracy reflects the total error (field and laboratory error) associated with a measurement. For samples, accuracy of chemical test results is assessed by spiking samples with known standards and establishing the average recovery. For a matrix spike (MS), known amounts of target compounds are added to a portion of the sample. A quantitative definition of average recovery accuracy is given in Section 5.3. If the percent recovery is determined to be outside of acceptance criteria, data will be qualified as described in the applicable validation procedures. The LOE for accuracy measurements will be a minimum frequency of 1 in 20 samples analyzed.

Field accuracy is affected by sample collection and handling procedures and by the accuracy of any field measurements. Field accuracy will be assured through careful execution of field procedures in accordance with applicable standard operating procedures (SOPs), and will be assessed through the analysis of field equipment and trip blanks. Analysis of blanks will monitor errors associated with the sampling process, field contamination, sample preservation, and sample handling. The DQO for field equipment and trip blanks is that all values are less than the reporting limit for each target chemical. If contamination is reported in the field equipment or trip blanks, data will be qualified as described in the applicable validation procedure.

Precision measures the reproducibility of repetitive measurements. It is a measure of the data spread when more than one measurement has been collected from the same sample. Analytical precision is a measurement of the variability associated with duplicate or replicate analysis of the same sample in the laboratory, and is determined by analysis of laboratory quality control samples (LCS), such as duplicate control samples (LCSD), matrix spike duplicates (MSD), or sample duplicates. Total precision is a measurement of the variability associated with the entire sampling and analytical process. It is determined by analysis of duplicate or replicate field samples, and measures variability introduced by laboratory and field operations. MSD samples are analyzed to assess analytical, matrix-related precision. Duplicate results are assessed using the relative percent difference (RPD) between duplicate measurements. A quantitative definition of precision is given in Section 5.3. The LOE for precision measurements will be a minimum of 1 in 20 samples analyzed.

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected under ideal conditions. The number of valid results divided by the number of expected results, expressed as a percentage, determines the completeness of the data set. The quantitative definition of completeness is given in Section 5.3. The target completeness objective will be 90 percent; the actual completeness may vary depending on the intrinsic nature of the samples. The completeness of the data will be assessed during QC reviews.

2.5 Special Training Requirements/Certification

All project staff working on the site will be health and safety trained, and will follow requirements specified in the HSP for the project, which can be found in the companion FSP (ARCADIS, 2004b). The HSP describes the specialized training required for personnel on this project and the documentation and tracking of this training.

2.6 Documentation and Records

Field documentation and records will be as described in Section 3 of this document and the FSP. Laboratory documentation will be per: (1) methods and QA protocols listed in Section 3 of this document, and (2) laboratory-specific SOPs.

3. Measurement Data Acquisition

This section presents sampling process design and requirements for sampling methods, sample handling and custody, analytical methods, QC, and instrumentation for the sampling activities that will be conducted as a part of the RI at the Omega Chemical OU-2. Data acquisition requirements and data management for these sampling events are also addressed in this section.

3.1 Sampling Process Design

3.1.1 Background

Background information and objectives are presented in Section 2 of this document. The primary objectives of this RI are to delineate the vertical and lateral extent of groundwater contamination at the OU-2 site.

3.1.2 Schedule of Analyses

The field investigation, as outlined in the UAO, is expected to continue approximately three months after mobilization.

3.1.3 Rationale for Sampling Design

3.1.3.1 Sampling Locations and Number of Samples

Groundwater sample locations and number of samples are summarized in Section 3 of the accompanying FSP.

3.1.3.2 Laboratory Analyses

Samples will be analyzed at a NELAP-certified laboratory (see Section 2.3.1.2).

The analytical parameters for the individual samples are detailed in Table 2 as well as the accompanying FSP in the request for analyses tables.

3.2 Sampling Method Requirements

Sampling method requirements have been detailed in the associated FSP in Section 5.

3.3 Sample Handling and Custody Requirements

A sample is physical evidence collected from a hazardous waste site, from the immediate environment, or from another source. The possession of samples must be traceable from the time the samples are collected until the data are reported. In addition to field notebooks, the chain-of-custody (COC) form is used to track sample custody from the field to the laboratory. Completed COC forms will be sent to the QAO.

3.3.1 COC

3.3.1.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- It is in your possession.

- It is in your view, after being in your possession.
- It was in your possession and then you locked it up to prevent tampering.
- It is in a designated secure area.

3.3.1.2 Field Custody

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly. The FTL determines whether proper custody procedures were followed during the field work, and decides if additional samples are required.

For each sample submitted to the laboratory for analysis, an entry will be made on a COC form supplied by the laboratory. The information to be recorded includes the sampling date and time, sample identification number, matrix type, requested analyses and methods, preservatives, and the sampler's name. Sampling team members will maintain custody of the samples until they are relinquished to laboratory personnel or a professional courier service. The COC form will accompany the samples from the time of collection until receipt by the laboratory. Each party in possession of the samples will sign the COC form signifying receipt, except professional couriers. The COC form will be placed in a plastic bag and shipped with samples inside the cooler. After the samples, ice, and chain-of-custody forms are packed in the coolers, the cooler will be sealed with custody tape before it is relinquished to the courier. A copy of the original completed form will be provided by the laboratory along with the report of results. Upon receipt, the laboratory will inspect the condition of the seal and sample containers, and report the information on the COC forms.

3.3.1.3 Transfer of Custody and Shipment

Samples are accompanied by a COC record. When transferring samples, the individuals relinquishing and receiving the samples sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the analyst at the laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate COC record accompanying each shipping container (one for each field or stationary laboratory). Shipping containers will be sealed with custody seals for shipment to the laboratory. Courier names, and other pertinent information, are entered in the "Received by" section of the COC record.

Whenever samples are split with a facility owner or agency, it is noted in the remarks section of the COC record. The note indicates with whom the samples are being split, and is signed by both the sampler and recipient. If the split is refused, this will be noted and signed by both parties. If a representative is unavailable or refuses to sign, this is noted in the remarks section of the COC record. When appropriate, as in the case where the representative is unavailable, the COC record should contain a statement that the samples were delivered to the designated location at the designated time.

All shipments are accompanied by the COC record identifying its contents. The original record and yellow copy accompanies the shipment to the laboratory, and the pink copy is sent to be retained by the FTL.

3.3.1.4 Laboratory Custody Procedures

A designated sample custodian accepts custody of the shipped samples, and verifies that the packing-list sample numbers match those on the COC records. Pertinent information as to shipment, pickup, and courier is entered in the "Remarks" section. The custodian then monitors sample temperature and enters the sample numbers into a bound notebook, which is arranged by project code and station number.

The laboratory custodian uses the sample identification number or assigns a unique laboratory number to each sample, and is responsible for seeing that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received, until the sample is exhausted or returned to the custodian. The data from sample analyses are recorded on the laboratory report form.

When sample analyses and necessary QA checks have been completed in the laboratory, the unused portion of the sample will be disposed of properly. All identifying stickers, data sheets, and laboratory records are retained as part of the documentation. Sample containers and remaining samples are disposed of in compliance with all federal, state, and local regulatory requirements.

3.3.2 Custody Seals

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals. One or more custody seals must be placed on each side of the shipping container (cooler).

3.3.3 Field Notebooks

Typical field information to be entered in the field notebook is included in Section 5.10 of the companion FSP (ARCADIS, 2004b). In addition to COC records, a bound field notebook must be maintained by each FTL to provide a daily record of significant events, observations, and measurements during field investigations. All entries should be signed and dated. It should be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project.

3.3.4 Corrections to Documentation

All original data recorded in field notebooks and COC records will be written with waterproof ink, unless prohibited by weather conditions. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one team, the FTL may make corrections simply by drawing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

3.4 Analytical Methods Requirements

Project analytes, methods, and required detection levels have been listed in Table 2. The analyses for volatiles, semivolatiles, and metals will be per EPA methodology.

The analyses for other analytes in Table 2 will be per the data quality indicators provided in Appendix B.

For 1,2,3-trichloropropane the method and QA/QC, the laboratory will follow California State guidance to achieve the needed low regulatory limit of 0.005 micrograms per liter. Laboratory-specific SOPs will be defined subsequent to selection of the laboratory, and prior to start of work.

3.5 Quality Control Requirements

3.5.1 Field QC Procedures

QC requirements related to the sample collection process (i.e., design, methods, handling, and custody) requirements have been discussed in the previous sections of this document.

Field QC samples include field duplicates, field blanks (i.e., trip and rinsate blanks), and laboratory QC samples (for matrix spike/matrix spike duplicates). QC samples will be collected immediately following collection of target samples, using the same procedures as those used for collection of the target sample. These procedures are presented in the accompanying FSP (ARCADIS, 2004b).

3.5.2 Laboratory Procedures

Laboratory QC procedures will include the following:

- Analytical methodology according to specific methods listed in Table 2;
- Instrument calibrations and standards as defined by EPA in SW-846, or other documents as appropriate;
- Laboratory blank measurements;
- Accuracy and precision measurements, at a minimum of 1 in 20, 1 per batch;
- Data reduction and reporting according to specific methods listed in Table 2; and
- Contract Laboratory Program (CLP)-type laboratory documentation.

The full CLP-type data package and validation will not be required for the screening (discrete) groundwater samples and investigation-derived waste (IDW) samples.

3.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Instrument maintenance logbooks are maintained in laboratories at all times. The logbooks, in general, contain a schedule of maintenance, as well as a complete history of past maintenance, both routine and non routine.

Preventive maintenance is performed according to the procedures described in the manufacturer's instrument manuals, including lubrication, source cleaning, detector cleaning, and the frequency of such maintenance. Chromatographic carrier gas-purification traps, injector liners, and injector septa are cleaned or replaced on a regular basis. Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the QC criteria.

Instrument downtime is minimized by keeping adequate supplies of all expendable items, where expendable means an expected lifetime of less than 1 year. These items include gas tanks, gasoline filters, syringes, septa, gas chromatography columns and packing, ferrules, printer paper and ribbons, pump oil, jet separators, open-split interfaces, and mass spectroscopy filaments.

Preventive maintenance for field equipment (e.g., pH meter) will be carried out in accordance with procedures and schedules outlined in the particular model's operation and maintenance manual.

3.7 Instrument Calibration and Frequency

The following subsections review instrument calibration and frequency information.

3.7.1 Field Calibration Procedures

For water analyses, field equipment requiring calibration includes: pH, electrical conductivity, temperature, dissolved oxygen and oxidation/reduction potential meters. These meters will be calibrated before the start of work and at the end of the sampling day. Any instrument "drift" from prior calibration should be recorded in a field notebook. Calibration will be in accordance with procedures and schedules outlined in the operations and maintenance manual for the particular instrument.

Calibrated equipment will be uniquely identified by using either the manufacturer's serial number or other means. A label with the identification number and the date when the next calibration is due will be physically attached to the equipment. If this is not possible, records traceable to the equipment will be readily available for reference. In addition, the results of calibrations and records of repairs will be recorded in a logbook.

Scheduled periodic calibration of testing equipment does not relieve field personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, the device must be removed from service, tagged so that it is not inadvertently used, and the appropriate personnel notified so that a recalibration or repair can be performed, or a substitute piece of equipment can be obtained.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented and the TM and QA/QC reviewer will be notified.

3.7.2 Laboratory Calibration Procedures

Laboratory calibration procedures are specified in the referenced methods for all parameters listed in Table 2.

3.8 Data Acquisition Requirements (Nondirect Measurements)

Previously collected data and other information will be used to assist decision making during the RI. These data will be in both hard copy and electronic format. Electronic data will be handled by the electronic data management system described below.

3.9 Data Management

All data for all parameters will undergo two levels of review and validation: (1) at the laboratory, and (2) outside the laboratory as described in Section 5. Following receipt of validated data, it will be input into the project database to facilitate database inquiries and report preparation. The data will be stored in the databases with all laboratory qualifiers included. The database will be maintained in a manner that is compatible with, and provided to, EPA or others at EPA's request. Major components for complete data management will be as follows:

- **Data Conversion/Manipulation/Review.** Reports of data from sampling are received from the QAO in hardcopy or electronic format. These data must be converted, input, reviewed, and QC checked.

  In addition, available data from other sources may be incorporated into the database. These data will need to be manually input, output, reviewed, QC checked, then uploaded into the database.

- **Preparation of Tables.** Data tables will be prepared following receipt of validated data from the QAO following each sample event. Queries will be created for the database to generate updated tables.

- **Database Documentation.** An update of the database and complete documentation will be performed at the end of the project. The commands, file names, and general operating procedures for all the data queries will be documented.

4. Assessment/Oversight

Audit programs are established and directed by the QAO to ensure that field and laboratory activities are performed in compliance with project controlling documents. This section describes responsibilities and requirements and methods for scheduling, conducting, and documenting audits of field and laboratory activities.

4.1 Field Audits

Field audits focus on appropriateness of personnel assignments and expertise, availability of field equipment, adherence to project controlling documents for sample collection and identification, sample handling and transport, use of QC samples, COC procedures, equipment decontamination, and documentation. Field audits are not required, but may be performed in the event significant discrepancies are identified that warrant evaluation of field practices.

4.2 Laboratory Audits

Laboratory audits include reviews of sample-handling procedures, internal sample tracking, SOPs, analytical data documentation, QA/QC protocols, and data reporting. Selected offsite laboratories will be licensed by the State of California as a certified testing laboratory and will be NELAP accredited. If no previous audit has been conducted by ARCADIS, an audit may be conducted by the QAO during the course of this project to ensure the integrity of sample handling and processing by the laboratory.

4.3 Data Audits

Data audits will be performed on analytical results received from the laboratories. These audits will be accomplished through the process of data validation as described in Section 5, or may involve a more detailed review of laboratory analytical records. ARCADIS personnel, or a contracted laboratory data consultant, will perform a review of the data consistent with the level of effort described in the National Functional Guidelines. This level of validation consists of a detailed review of sample data, including verification of data calculations for calibration and quality control samples to assess if these data are consistent with method requirements. Upon request, the laboratory will make available all supporting documentation in a timely fashion.

4.4 Reports to Management and Responsibilities

Upon completion of any audit, the auditor will submit to the PM and FTL a report or memorandum describing any problems or deficiencies identified during the audit. It is the responsibility of the PM to determine if the deviations will result in any adverse effect on the project conclusions. If it is determined that corrective action is necessary, procedures outlined in Section 4.5 will be followed. The auditor will also debrief the laboratory or the field team at the end of the audit and request that the laboratory or field team comply with the corrective action request.

4.5 Corrective Actions

If QC audits result in detection of unacceptable conditions or data, the FTL will be responsible for developing and initiating corrective action. The PM will be notified if nonconformance is of program significance or requires special expertise not normally available to the project team. In such cases, the PM will decide whether any corrective action should be pursued. Corrective action may include the following:

- Reanalyzing samples if holding time criteria permit;
- Resampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and
- Accepting data while acknowledging a level of uncertainty.

4.6 Reports to Management

A QA report will be prepared on the performance of sample collection and data quality. The report will include the following:

- Assessment of measurement data accuracy, precision, and completeness;
- Results of performance audits;
- Results of systems audits; and
- Significant QA problems and recommended solutions.

Monthly progress reports will summarize overall project activities and any problems encountered. QA reports generated on sample collection and data quality will focus on specific problems encountered and solutions implemented. Alternatively, in lieu of a separate QA report, sampling and field measurement data quality information may be summarized and included in the final reports summarizing field activities. The objectives, activities performed, overall results, sampling, and field measurement data quality information of the project will be summarized and included in the final field activities reports along with any QA reports.

5. Data Validation and Usability

5.1 Data Review, Validation and Verification Requirements

Chemical data will undergo two levels of review: (1) at the laboratory, and (2) outside the laboratory. Data will be reviewed by the QAO or by a subcontracted laboratory data consultant.

Chemical data, with the exception of IDW data and discrete (screening) groundwater samples, will be reviewed outside the laboratory at the LOE described below. The IDW data may undergo a lower LOE if analyzed in separate analytical batches independent of the site samples.

A full data package (CLP-type) and validation will not be required for the discrete groundwater samples collected using a bailer. These samples are considered screening samples and will be used for selecting well-screen depth intervals; the CLP-type package and validation are not considered necessary. Furthermore, the decision will need to be made shortly after the analytical results become available to avoid standby time of the drill rig. The data cannot be validated in such a short timeframe.

Tier 2 LOE, described below, may be modified during the review per the QAOs, depending on available resources. Changes will be documented as amendments or technical memoranda to project files.

Data will be reviewed at Tier 2 and Tier 3 levels. Ninety percent of the groundwater sample analytical batches will be reviewed for all the analytical parameters, detections and nondetections, at Tier 2. Also, 10 percent of the analytical batches will be selected for Tier 3 for all parameters, detections and nondetections. The analytical batches selected for Tier 3 review will be selected at random, unless a new laboratory is performing the analyses. In this instance, the first analytical batch should undergo the Tier 3 review as a proactive measure.

Tier 2 review has been selected to provide for review of all the QA/QC summary forms in accordance with EPA CLP National Functional Guidelines for Inorganic/Organic Data review (to include all calibrations and internal standards) and flagging of the individual results, as opposed to review of a subset of the QC data as is the case for Tier 1 review. Tier 2 economizes the laboratory data review compared to Tier 3 by limiting the review to QC summary data as opposed to raw data checks. Review of QC summary data that includes all QC parameters provides for the needed comprehensive coverage; this scope is covered under the Tier 2 review.

The LOE detailed above is based on the objectives of this project and deals with quantitative evaluation of samples at trace levels for all analytes. The full database requires consistent flags for comparable and reproducible data, which should be met with this LOE. These levels of effort are appropriate because data are compared quantitatively to past data to establish quantitative trends, as well as compared to regulatory limits. Quantitative trends apply to all analytes, not just a subset of the target analytes. All analytes are contaminants of concern, even though, for example, TCE may be detected more frequently than other analytes. Establishing the validity of nondetect results is as important as the detected results for monitoring, thus both detection and nondetection results will be reviewed.

5.2 Validation and Verification Methods

Initial data reduction, validation, and reporting at the laboratory will be performed as described in the laboratory SOPs.

Independent data validation by ARCADIS or their designee will follow EPA *Contract Laboratory Program National Functional Guidelines for Inorganic/Organic Data Review* (EPA, 1994a, 1994b, 1999, and 2002a) as described above.

5.3 Reconciliation with DQOs

Results obtained from the project will be reconciled with the requirements specified in Table 2 of this QAPP. Assessment of data for precision, accuracy, and completeness will be per the following quantitative definitions.

5.3.1 Precision

If calculated from duplicate measurements:

$$\text{RPD} = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) / 2}$$

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	larger of the two observed values

If calculated from three or more replicates, use relative standard deviation (RSD) rather than RPD:

$$\text{RSD} = (s / \bar{y}) \times 100\%$$

RSD	=	relative standard deviation
s	=	standard deviation
$\bar{y}$	=	mean of replicate analyses

Standard deviation, s, is defined as follows:

$$s = \sqrt{\sum_{i=1}^{n} \frac{(yi - \bar{y})^2}{n-1}}$$

s	=	standard deviation
yi	=	measured value of the ith replicate
$\bar{y}$	=	mean of replicate analyses
n	=	number of replicates

5.3.2 Accuracy

For measurements where matrix spikes are used:

$$\%R = 100x \frac{S - U}{C_{sa}}$$

%R	=	percent recovery
S	=	measured concentration in spiked aliquot
U	=	measured concentration in unspiked aliquot
C_{sa}	=	actual concentration of spike added

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \text{ x } \left[\frac{C_m}{C_{sm}} \right]$$

%R	=	percent recovery
C_m	=	measured concentration of SRM
C_{sm}	=	actual concentration of SRM

5.3.3 Completeness (Statistical)

Defined as follows for all measurements:

$$\%C = 100\% \text{ x } \left[\frac{V}{T} \right]$$

%C	=	percent completeness
V	=	number of measurements judged valid
T	=	total number of measurements

6. References

ARCADIS, 2004a. *Remedial Investigation Work Plan – Omega Chemical Operable Unit 2, Whittier, California*: Unpublished report prepared for the Omega Small Volume Group (OSVOG), November 1.

ARCADIS, 2004b. *Field Sampling Plan – Omega Chemical Operable Unit 2, Whittier, California*: Unpublished report prepared for the Omega Small Volume Group (OSVOG), November 19.

Camp Dresser & McKee (CDM). 2003. *Final On-Site Soils Remedial Investigation/Feasibility Study Work Plan.*

CH2M Hill 2004a. *Field Sampling Plan for Omega Chemical Superfund Site Operable Unit 2, Remedial Investigation/Feasibility Study Oversight.* Prepared by CH2M Hill, February.

CH2M Hill 2004b. *Quality Assurance Project Plan - Omega Chemical Superfund Site Operable Unit 2, Remedial Investigation/Feasibility Study..* Prepared by CH2M Hill, July.

EPA, 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. September, revised 1992, 1994, 1996, and subsequent proposed revisions and draft methods.

EPA, 1994a, Contract Laboratory Program National Function Guidelines for Inorganic Data Review, EPA540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C.

EPA, 1994b, Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA540/R-94/012, Office of Emergency and Remedial Response, Washington, D.C. Revised October 1999.

EPA. 2000. *Guidance for the Data Quality Objectives Process.* EPA QA/G-4. September.

EPA. 2001. *EPA Requirements for Quality Assurance Project Plans.* EPA QA/R-5, EPA/240/B-01/003. March

EPA. 2002a. *Guidance on Environmental Data Verification and Data Validation.* EPA QA/G-8, EPA/240/R-02/004. November.

EPA. 2002b. *EPA Guidance for Quality Assurance Project Plans.* EPA QA/G-5, EPA/240/R-02/009. December.

Weston Solutions, Inc. (Weston). 2003. Omega Chemical Superfund Site; Whittier, California; Phase 2 Groundwater Characterization Study Report. June.

ARCADIS

Tables

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
TCL Volatile Organic Compounds (8260B)					
Acetone	Exceedances with respect				
Benzene	to federal and state drinking	1	CA Primary MCL (A)	0.5	0.15 (E)
Bromodichloromethane	water standards, and state	100	USEPA Primary MCL (C)	0.5	2.5 (I) ; 100-proposed (A)
Bromoform	action levels.	100	USEPA Primary MCL (C)	0.5	45 (I) ; 100-proposed (A)
Bromomethane	Evaluate water treatment	500	CA Proposition 65 Regulatory Level	0.5	
n-Butylbenzene	system design.	260	CA DHS State Action Level (F)		
sec-Butylbenzene	Evaluate remedial action	260	CA DHS State Action Level (F)		
Carbon disulfide	performance.	160	CA DHS State Action Level (F)		
Carbon tetrachloride		0.5	CA Primary MCL (A)	0.5	0.1 (E)
Chlorobenzene		100	USEPA Primary MCL (C)		50 (H)
Chloroethane		16	Other Taste and Odor (H)	0.5	100 (I)
Chloroform					
Chloromethane			No Applicable ARAR		
2-Chlorotoluene		140	CA DHS State Action Level (F)		
4-Chlorotoluene		140	CA DHS State Action Level (F)		
Cyclohexane					
Dibromomethane					
Dibromochloromethane					
Dibromochloropropane (DBCP)		0.2	USEPA Primary MCL (C)		0.05 (I)
1,2-Dibromoethane		0.05			0.1 (I)
1,2-Dichlorobenzene		600	CA DHS State Action Level (F)	0.5	600 (E)
1,3-Dichlorobenzene		600	CA DHS State Action Level (F)	0.5	600 (F)
1,4-Dichlorobenzene		5	CA Primary MCL (A)	0.5	6 (E)
Dichlorodifluoromethane		1,000	CA DHS State Action Level (F)		

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
1,1-Dichloroethane	Exceedances with respect	5	CA Primary MCL [A]	0.5	3 [E]
1,2-Dichloroethane	to federal and state drinking	0.5	CA Primary MCL [A]	0.5	0.4 [E]
1,1-Dichloroethylene	water standards, and state	6	CA Primary MCL [A]	0.5	7 [C]; 10 [E]
cis-1,2-Dichloroethylene	action levels.	6	CA Primary MCL [A]	0.5	70 [C]
trans-1,2-Dichloroethylene	Evaluate water treatment	10	CA Primary MCL [A]	0.5	100 [C]
Dichloromethane	system design.	5	CA/USEPA Primary MCL [A] [C]	0.5	4 [E]
(Methylene Chloride)	Evaluate remedial action				
1,2-Dichloropropane	performance.	5	CA/USEPA Primary MCL [A] [C]	0.5	0.5 [E]
2,2-Dichloropropane					
1,1-Dichloropropene					
1,3-Dichloropropene		0.5	CA Primary MCL [A]		
cis-1,3-Dichloropropene		0.5	CA Primary MCL [A]	0.5	0.2 [E]
trans-1,3-Dichloropropene		0.5	CA Primary MCL [A]	0.5	0.2 [E]
Ethane					
Ethene					
Ethybenzene		300	CA Primary MCL [A]	0.5	700 [C]; 300 [E]; 29 [H]
Hexachlorobutadiene					
2-Hexanone					
Isopropylbenzene (Cumene)		770	CA DHS State Action Level (F)	0.5	
Methane					
Methyl acetate					
Methyl ethyl ketone		8400	Other Taste and Odor [H]	5	
Methyl isobutyl ketone (MIBK)		120	CA DHS State Action Level (F)		1300 [H]
Methylcyclohexane					
Napthalene		170	CA DHS State Action Level (F)		
n-Propylbenzene		260	CA DHS State Action Level (F)		

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
Styrene	Exceedances with respect	100	CA/USEPA Primary MCL (A) (C)	0.5	11 (H)
1,1,2,2-Tetrachloroethane	to federal and state drinking	1	CA Primary MCL (A)	0.1	0.5 (E) ; 1.5 (I)
Tetrachloroethylene (PCE)	water standards, and state	5	CA/USEPA Primary MCL (A) (C)	0.5	0.06 (E)
Toluene	action levels.	150	CA Primary MCL (A)	0.5	42 (H) ; 1,000 (C)
1,2,3-Trichlorobenzene	Evaluate water treatment				
1,2,4-Trichlorobenzene	system design.	5	CA Primary MCL (A)/CA PHG (E)	0.5	70 (C)
1,1,1-Trichloroethane (1,1,1-TCA)	Evaluate remedial action performance.	200	CA/USEPA Primary MCL (A) (C)	0.5	
1,1,2-Trichloroethane		5	CA/USEPA Primary MCL (A) (C)	0.5	5 (I)
Trichloroethylene (TCE)		5	CA/USEPA Primary MCL (A) (C)	0.5	0.8 (E)
Trichlorofluoromethane		150	CA Primary MCL (A)	5	700 (E)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		1,200	CA Primary MCL (A)	10	4,000 (E)
1,2,4-Trimethylbenzene		330	CA DHS State Action Level (F)		
1,3,5-Trimethylbenzene		330	CA DHS State Action Level (F)		
Vinyl chloride		0.5	CA Primary MCL (A)	0.5	0.05 (E) ; 2 (C)
Xylene(s)		1,750	CA Primary MCL (A)	1,800	17 (H) ; 10,000 (C)
Additional Volatiles	Exceedances with respect				
Methyl tert-butyl ether (MTBE)	to federal and state drinking water standards, and state action levels.	13	CA Secondary MCL (B)	3	13 (E)

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (μg/L)	Applicable ARAR [1]	California DHS DLR (μg/L) [2]	Additional Regulatory Limits (μg/L)
TCL Semivolatile Organic Compounds					
Acenaphthene	Exceedances with respect to federal and state drinking water standards, and state action levels. Evaluate water treatment system design. Evaluate remedial action performance.				
Acenaphthylene					
Acetophenone					
Aniline (Phenylamine) (Aminobenzene)					
Anthracene					
Benzaldehyde					
Benzoic Acid (Carboxybenzene)					
Benzo(a)anthracene					
Benzo(a)pyrene		0.2	CA/USEPA Primary MCL [A] [C]	0.1	0.004 [E]
Benzo(b)fluoranthene					
Benzo(g,h,i)perylene					
Benzo(k)fluoranthene					
Benzyl Alcohol (Phenylmethanol)					
1,1'-Biphenyl					
Bis(2-chloroehoxy)methane					
Bis(2-chloroethyl)ether					
Bis(2-chloroisopropyl)ether					
4-Bromophenyl-phenyl ether					
Butylbenzyl phthalate (BBP)					
Caprolactam					
Carbazole					
4-Chloro-3-methylphenol					
4-Chloroaniline					

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
2-Chloronaphthalene	Exceedances with respect to federal and state drinking water standards, and state action levels.				
2-Chlorophenol					
4-Chlorophenyl-phenyl ether					
Chrysene					
Di(2-ethylhexyl)adipate	Evaluate water treatment system design.	400	CA/USEPA Primary MCL (A) (C)	5	200 (E)
Di(2-ethylhexyl)phthalate		4	CA Primary MCL (A)	3	6 (C); 12 (E)
dibenz(a,h)anthracene	Evaluate remedial action performance.				
Dibenzofuran (Diphenylene oxide)					
3,3'-Dichlorobenzidine					
2,4-Dichlorobenzidine					
2,4-Dichlorophenol					
Diethyl phthalate (DEP)					
Dimethyl phthalate					
2,4-Dimethylphenol		100	CA DHS State Action Level (F)		
4.6-Dinitro-2-methylphenol					
2,4-Dinitrophenol					
2,4-Dinitrotoluene					
2,6-Dinitrotoluene					
Di-n-butylphthalate (Dibutyl phthalate)					
Endothall		100	CA/USEPA Primary MCL (A) (C)	45	580 (E)
Fluoranthene (Idryl)					
Fluorene					
Glyphosate		700	CA/USEPA Primary MCL (A) (C)	25	1000 (E)
Hexachlorobenzene		1	CA/USEPA Primary MCL (A) (C)	0.5	0.03 (E)

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
Hexachlorocyclopentadiene	Exceedances with respect	50	CA/USEPA Primary MCL [(A)(C)]	1	50 [(E)]
Hexachloroethane	to federal and state drinking				
Indeno(1,2,3-cd)pyrene	water standards, and state				
Isophorone	action levels.				
2-Methylnaphthalene	Evaluate water treatment				
2-Methylphenol	system design.				
4-Methylphenol	Evaluate remedial action				
3,4-Methylphenol	performance.				
2-Nitroaniline					
3-Nitroaniline					
4-Nitroaniline					
4-Nitrophenol					
Pentachlorophenol		1	CA/USEPA Primary MCL [(A)(C)]	0.2	0.4 [(E)]
Phenanthrene					
Phenol		4,200	CA DHS State Action Level (F)		
Pyrene					
Pyridine					
2,4,6-Trichlorophenol					
2,4,5-Trichlorophenol					
Emergent Compunds	Exceedances with respect				
1,4-Dioxane	to federal and state drinking	3	CA DHS State Action Level (F)		15 [(I)]
N-Nitrosodimethylamine (NDMA)	water standards, and state action levels.	0.01	CA DHS State Action Level (F)		0.02 [(I)]
1,2,3-Trichloropropane (1,2,3-TCP)	Evaluate water treatment system design.	0.005	CA DHS State Action Level (F)		

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [(1)]	California DHS DLR (µg/L) [(2)]	Additional Regulatory Limits (µg/L)
Treatment/Discharge Parameters					
Total Organic Parameters Total Organic Carbon Biological Oxygen Demand Chemical Oxygen Demand	Evaluate groundwater treatment alternatives. Evaluate treated groundwater discharge alternatives.				

Notes:

(1) ARARs from June 2003 California EPA Compilation of Water Quality Goals and Updates through September 2003.

(2) California Department of Health Services required Detection Limit for Purposes of Reporting (DLR).

(3) Calculated ARAR based on hardness = 120 mg/L as CaCO3

(A) California Department of Health Services Primary MCL for Drinking Water.

(B) California Department of Health Services Secondary MCL for Drinking Water.

(C) USEPA Primary MCL for Drinking Water.

(D) USEPA Secondary MCL for Drinking Water.

(E) California Office of Environmental Health Hazard Assessment Public Health Goal for Drinking Water.

(F) California Department of Health Services State Action Level for Toxicity.

(G) California Department of Health Services State Action Level for Taste and Odor.

(H) Other Taste and Odor Thresholds.

(I) California Proposition 65 Regulatory Level for Drinking Water.

Table 1. Data Needs and Uses
Omega Chemical Operable Uit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [(1)]	California DHS DLR (µg/L) [(2)]	Additional Regulatory Limits (µg/L)
Emergent Compounds					
Chromium (VI)	Exceedances with respect	11(0.2) [4]	California Toxics Rule for Aquatic Life Protection (H)	0.5	0.4 (E)
Perchlorate	to federal and state drinking	4	CA DHS State Action Level (F)	0.5	7 (C); 10 (E)
	water standards, and state			0.5	70 (C)
	action levels.			0.5	100 (C)
	Evaluate water treatment			0.5	4 (E)
	system design.				
TAL Inorganics				0.5	0.5 (E)
Aluminum	Exceedances with respect	50	USEPA Secondary MCL (D) [11]		
Antimony	to federal and state drinking	6	CA/USEPA Primary MCL (A) (C)		
Arsenic	water standards, and state	10	USEPA Primary MCL (C)		
Barium	action levels.	1,000	CA Primary MCL (A)	0.5	0.2 (E)
Beryllium	Evaluate groundwater	4	CA/USEPA Primary MCL (A) (C)	0.5	0.2 (E)
Cadmium	treatment alternatives and	5	CA/USEPA Primary MCL (A) (C)		
Calcium	treated groundwater				
Chromium (total)	discharge options.	50	CA Primary MCL (A)	0.5	700 (C); 300 (E); 29 (H)
Cobalt					
Copper		11 [2]	California Toxics Rule for Aquatic Life Protection (H)		
Iron		300	USEPA Secondary MCL (D) [11]	0.5	
Lead		3.1	California Toxics Rule for Aquatic Life Protection (H)		
Magnesium					
Manganese		50	CA/USEPA Secondary MCL (B) (D)	5	
Mercury		2	CA/USEPA Primary MCL (A) (C)		1300 (H)
Molybdenum					
Nickel		61	California Toxics Rule for Aquatic Life Protection (H)		
Potassium					
Selenium		5	California Toxics Rule for Aquatic Life Protection (H)		

Table 1. Data Needs and Uses
Omegal Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
Silver	Exceedances with respect	4.7 (2)	California Toxics Rule for Aquatic Life Protection (H)	10	100 (B) (D)
Sodium	to federal and state drinking				
Thalium	water standards, and state	2	CA/USEPA Primary MCL (A) (C)	1	0.1 (E)
Vanadium	action levels.	50	CA DHS State Action Level (F)	3 (preliminary)	
Zinc	Evaluate groundwater	140 (2)	California Toxics Rule for Aquatic Life Protection (H)	50	5000 (B) (D)
Cyanide	treatment alternatives and treated groundwater discharge options.	5.2	California Toxics Rule for Aquatic Life Protection (H)	100	200 (C); 150 (E)
Additional Inorganics					
Boron	Evaluate groundwater	1,000	CA DHS State Action Level (F)		
Silicon	treatment alternatives and treated groundwater discharge options.				
Treatment/Discharge Parameters					
pH	Evaluate groundwater	6.5 to 8.5	USEPA Secondary MCL (D)		
Alkalinity	treatment alternatives and				
Ammonia	treated groundwater	500	Other Taste and Odor (H)		
Bicarbonate	discharge options.				
Bromide	Exceedances with respect				
Chloride	to federal and state drinking	250,000	CA/USEPA Secondary MCL (B) (D)		
Fluoride	water standards, and state	1,000	CA PHG (E)	100	2000 (A) (D)
Nitrate (as N)	action levels.	10,000	USEPA Primary MCL (C)		10000 (E)
Nitrite (as N)	↓	1,000	CA/USEPA Primary MCL (A) (C)	400	1000 (E)
Phosphorus (orthophosphate, total phosphorus)					
Sulfate		250,000	CA Secondary MCL (B)	500	250,000 (D)

Table 1. Data Needs and Uses
Omegal Cheical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
Total dissolved solids (TDS)	Evaluate groundwater treatment alternatives and treated groundwater discharge options. Exceedances with respect to federal and state drinking water standards, and state action levels.	250,000	CA/USEPA Secondary MCL [B] [D]		

Notes:
(1) ARARs from June 2003 California EPA Compilation of Water Quality Goals and Updates through September 2003.
(2) Calculated ARAR based on hardness = 120 mg/L as $CaCO_3$
(3) California Department of Health Services required Detection Limit for Purposes of Reporting (DLR).
(4) 0.2 µg/L detection level is needed for comparability to other databases in the region per previous DHS limit.
(A) California Department of Health Services Primary MCL for Drinking Water.
(B) California Department of Health Services Secondary MCL for Drinking Water.
(C) USEPA Primary MCL for Drinking Water.
(D) USEPA Secondary MCL for Drinking Water.
(E) California Office of Environmental Health Hazard Assessment Public Health Goal for Drinking Water.
(F) California Department of Health Services State Action Level for Toxicity.
(G) California Proposition 65 Regulatory Level for Drinking Water
(H) California Toxics Rule for Freshwater Aquatic Life Protection - Continuous (4-day average) Concentration.
(I) California Toxics Rule for Freshwater Aquatic Life Protection - Maximum (1-hr average) Concentration
(J) Other Taste and Odor Thresholds

ARCADIS

Table 2. Measurement Performance Criteria
Omega Chemical Operable Unit 2, Whittier, California

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
Volatile Organic Compounds					
TCL Volatile Organic Compounds (VOCs) plus MTBE [a]	EPA 8260B	(c)	70-130/CLP	±30	90
TCL [a] Semivolatile Organic Compounds (SVOCs)	CLP [b]	(c)	CLP		
Emergent Compounds					
1,4-Dioxane	EPA 8720 [b]	1 µg/L	40-130	±30	90
NDMA	Modified EPA Method 1625 [b]	0.02 µg/L	50-125	±30	90
Perchlorate	EPA 314 [b,d]	5 µg/L	50-150	±50	90
Hexavalent Chromium	EPA 218.6 [b,d]	0.2 µg/L	70-140	±30	90
1,2,3 TCP	(i)	0.005 µg/L	(i)	(i)	90
Groundwater Treatment and Discharge Parameters					
TAL [a] Metals (field filtered) plus Boron, Silicon	EPA 314 [b,d] EPA 200.8 [d,b] EPA 245.1/CLP		70-130	±30	90
Cyanide	EPA 335.4 [d,b]	10 mg/L	75-125	±25	90
Bromide	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Chloride	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Fluoride	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrate-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrite-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Orthophosphate-P	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Sulfate	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Kjeldahl Nitrogen (TKN)	EPA 351.2 [d,b]	1.0 mg/L	75-125	±25	90
Ammonia	EPA 350.2 [d,b]	0.3 mg/L	75-125	±25	90
Total Phosphorus	EPA 365.4 [d,b]	0.3 mg/L	75-125	±25	90
Total Dissolved Solids (TDS)	EPA 160.1 [d,b]	20 mg/L	75-125	±25	90
Alkalinity	SM 2320B [b,e]	20 mg/L	75-125	±25	90
Total Organic Carbon	EPA 415.1 [d]	2.0 mg/L	75-125	±30	90

Table 2. Measurement Performance Criteria
Omega Chemical Operable Unit 2, Whittier, California

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
BOD	SM 5210B [e]	3mg/L	75-125	±25	90
COD	SM 5220D [e]	5.0 mg/L	75-125	±30	90
Field Analysis for Volatile Organics	(i)	(j)	(j)	(j)	90

[a] Target Compound List (TCL) and Target Analyte List (TAL) as shown in Table A-1 and Appendix B. MTBE: methyl tert butyl ether.

[b] Volatile organics, semivolatile organics, metals and cyanide may be analyzed by SW 896 Procedures, depending on availability.

[c] For volatile organics, detection limits will be at 1 part per billion (ppb) for all except 0.5 ppb for vinyl chloride, carbon tetrachloride, 1,2 dichloroethane, cis and trans-1,3-dichloropropene, and 2 ppb for 1,2-dibromo-3-chloropropene.

[d] U.S. Environmental protection Agency, 1979. *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983; U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid* Waste, SW846.

[e] *Standard Methods for the Examination of Water and Wastewater*, 17th Edition (1989).

[f] State of California Department of Health Services (DHS) method Determination of Perchlorate by Ion chromatography.

[g] Silica to be determined as silica by EPA 200.7 with a detection limit of <01 ppm.

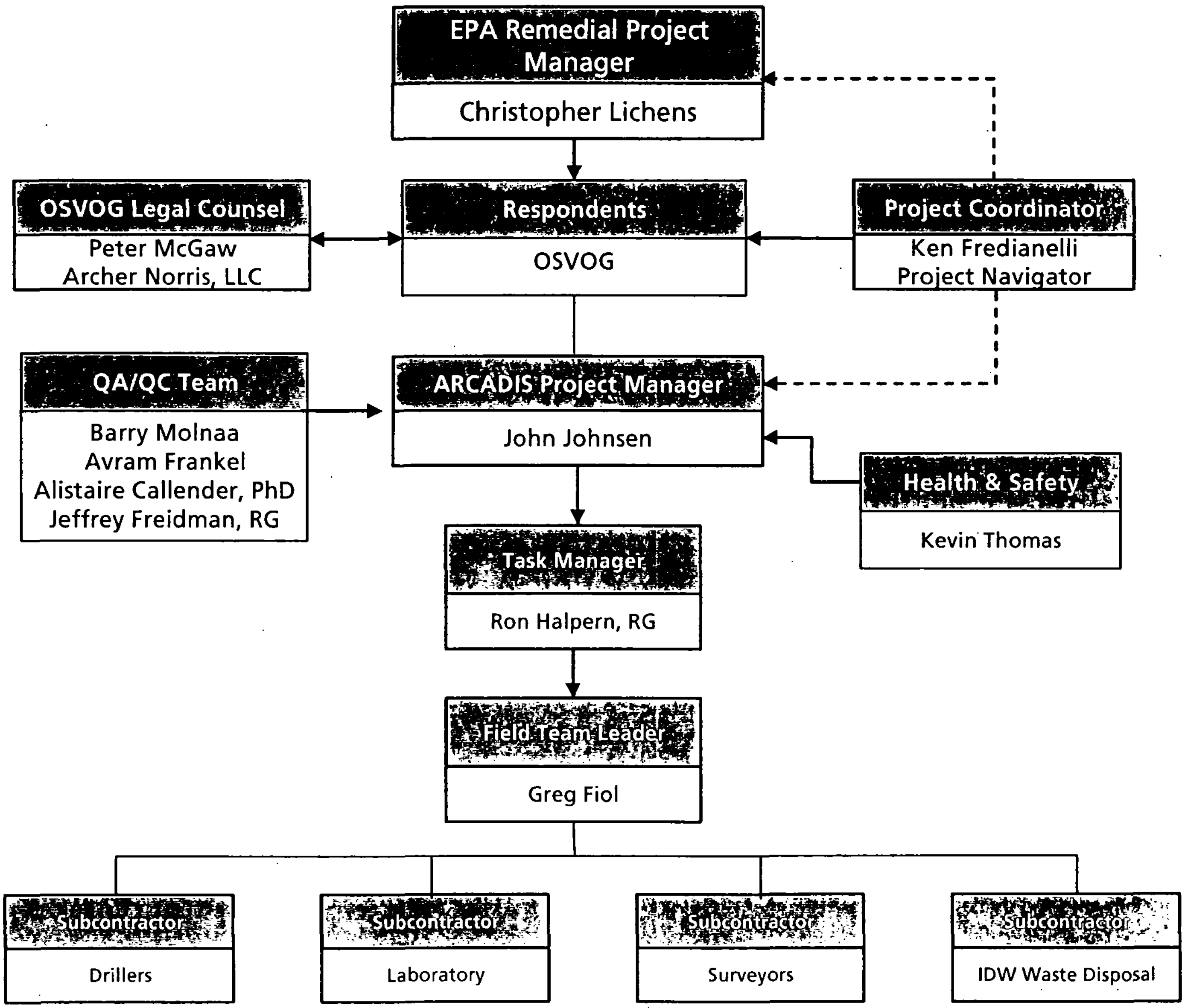
[h] Target detection level is reporting level, see text for explanation.

[i] The method and QA/QC will follow California State guidance to achieve the needed low regulatory limit. Laboratory-specific standard operating procedures will be defined prior to start of work, and subsequent to selection of laboratory.

[l] Volatile organics to be analyzed in the field will be the same list as the offsite laboratory analyses (a), target detection levels will also be equivalent to the offsite laboratory analyses. Method will be based on 8260/GC/MS. Method and field laboratory-specific standard operating procedures will be defined prior to start of work.

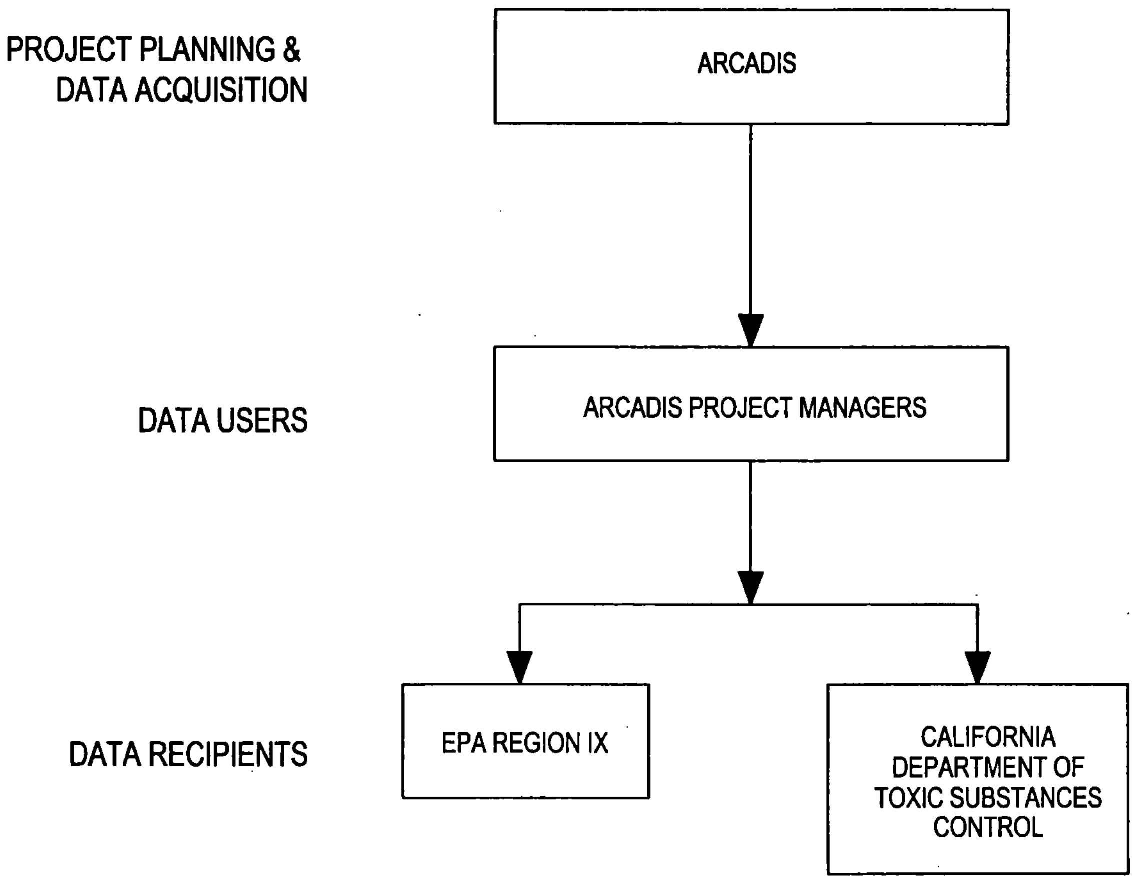
ARCADIS

Figures

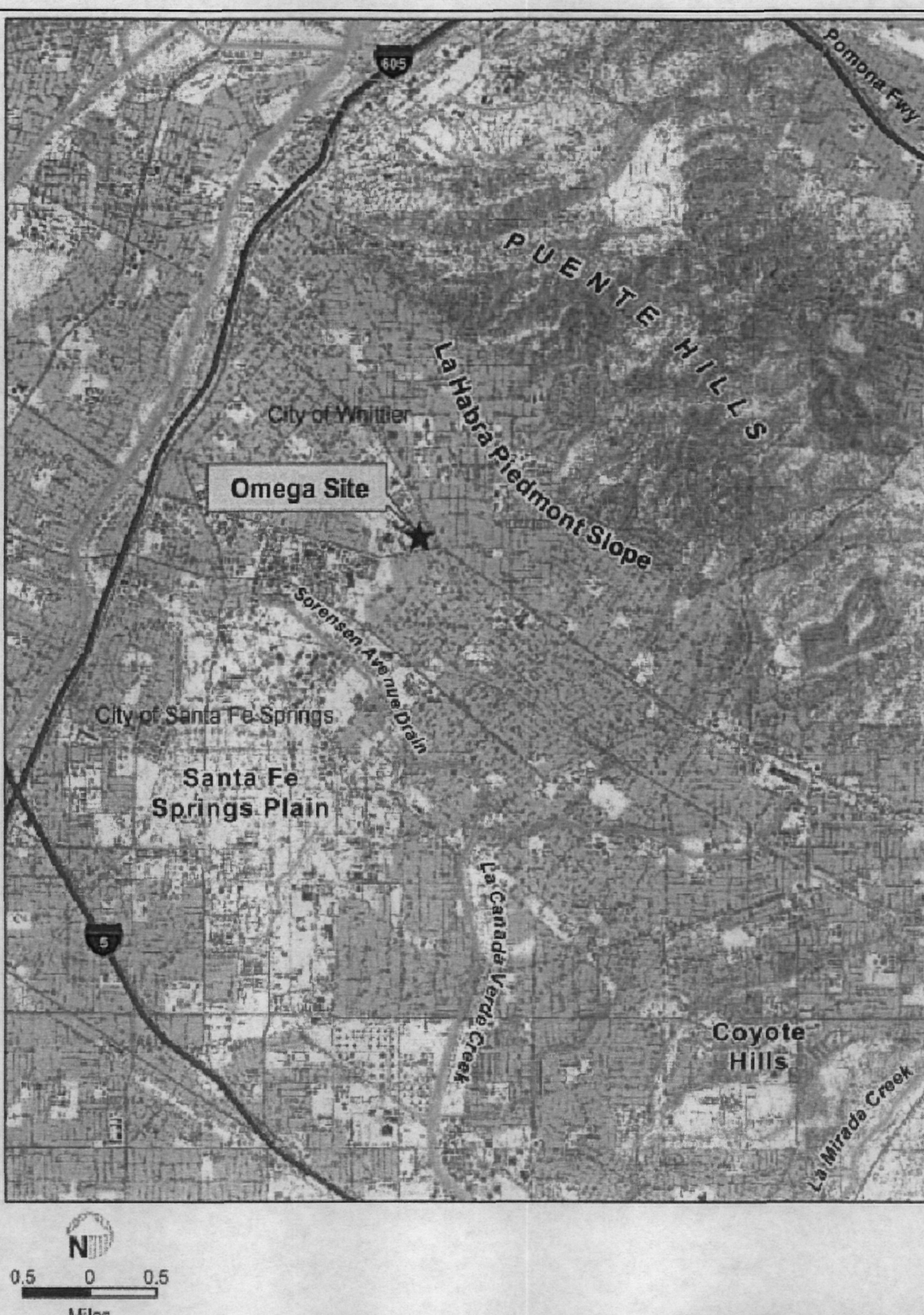


Area Manager: K. THOMAS Project Director: J. FRIEDMAN Task Manager: R. HALPERN Technical Review: R. HALPERN	ARCADIS Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	PROJECT TEAM REMEDIAL INVESTIGATION WHITTIER, CALIFORNIA	Project Number: CA646.01.01 Drawing Date: 11/12/04 Figure: 1

Date\Time : Tue, 16 Nov 2004 – 11:00am
Path\Name : G:\DRAWINGS\APROJECT\OMEGA CHEMICAL\Project Team.dwg
Current Plotstyle : ByLayer
Layout Tab: Layout1
Acad Version : R16.1s (LMS
User Name : aquinones



Area Manager K. THOMAS	ARCADIS	Project Number CA646.01.01
Project Director J. FRIEDMAN	DATA USERS/RECIPIENTS RI/FS FIELD ACTIVITIES	Drawing Date 11/12/04
Task Manager R. HALPERN	Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	Figure 2
Technical Review R. HALPERN	REMEDIAL INVESTIGATION WHITTIER, CALIFORNIA	



SOURCE: CHRM HILL, INC. FIGURE 1-1 SITE LOCATION MAP

Area Manager K. THOMAS	ARCADIS	SITE LOCATION MAP	Project Number CA646.01.01
Project Director J. FRIEDMAN			Drawing Date 9/7/04
Task Manager R. HALPERN	Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	OMEGA CHEMICAL SUPERFUND SITE WHITTIER, CALIFORNIA	Figure 3
Technical Review R. HALPERN			

Acad Version : R16.1s (LMS Tech) User Name : oquinones
Date\Time : Tue, 16 Nov 2004 - 10:46am Path\Name : G:\DRAWINGS\PROJECT\OMEGA CHEMICAL\Site Location Map.dwg
Current Plotstyle : ByLayer Layout Tab: Layout1

ARCADIS

Appendix A

Data Quality Objectives

Data Quality Objectives (DQOs)
Well Construction and Groundwater Sampling
Remedial Investigation
Omega Chemical Superfund Site – Operable Unit 2

Step 1. State the Problem

1) *Identify the members of the planning team* – The members of the planning team include the Environmental Protection Agency (EPA) Remedial Project Manager (RPM), the Project Coordinator (PC), ARCADIS' Project Manager (PM), ARCADIS's Task Manager (TM), and ARCADIS's Quality Assurance Officer (QAO).

2) *Identify the primary decision maker* – There will not be a primary decision maker. Decisions will be made by consensus.

3) *Develop a concise description of the problem* – The Omega Chemical Corporation (Omega) is a former refrigerant/solvent recycling operation located in Whittier, California. A series of soil gas, soil and groundwater investigations have been performed at the former Omega Chemical Facility (a.k.a. Operable Unit 1 [OU-1]) by a variety of consultants beginning in 1985. Chlorinated hydrocarbons, primarily PCE, TCE, 1,1-DCE, cis-1,2-DCE and chloroform, and Freons (Freon 11 and Freon 113) were identified as the primary chemicals of concern directly beneath the Omega site. Existing groundwater and soil data indicate that elevated concentrations of volatile organic compounds (VOCs) and other compounds are present in the soil and groundwater beneath the OU-1. A plume of VOCs in shallow groundwater extends approximately 2 miles from the Omega site to the southwest. The groundwater plume extending downgradient from OU-1 has been termed "Operable Unit 2 (OU-2)". Although the former Omega facility is located at the head of the plume, and is likely a contributing source of the plume, the distribution of some contaminants suggests there may be one or more additional sources contributing to the plume.

   The primary objective of this investigation is estimate the vertical and lateral extent of groundwater contamination known as OU-2.

   EPA has conducted a record search that indicated industrial facilities other than Omega likely contributed to groundwater contamination within OU-2. The current understanding is that the groundwater contamination present at OU-2 is a continuous, co-mingled plume originating from multiple source areas. This investigation will assess the continuity of groundwater contamination at OU-2 and characterize the main source areas of the contamination. Many of these facilities are currently under a regulatory oversight and the extent of contamination has been addressed by remedial investigation. As part of the Omega investigation, reports on these sites maintained at the Los Angeles Regional Water Quality Control Board (LARWQCB) and the Department of Toxic Substances Control (DTSC) will be reviewed (by EPA) and the information complied and evaluated.

The problem, tasked by the UAO, is summarized as follows:

a) The vertical and lateral extent, as well as the nature of contamination in groundwater beneath OU-2 needs to be determined. The trend in contaminant concentration in groundwater needs to be evaluated. The EPA has tasked the Omega Small Volume Group (OSVOG) with installing 11 groundwater monitoring wells and one extraction well within and on the perceived outer edges of the plume to accomplish this task.

b) The risk to human health and the environment from contaminants present at OU-2 needs to be assessed. The UAO Scope of Work indicated this task will be performed by the EPA.

c) The presence, extent, and concentrations of emergent contaminants (1,4-dioxane, perchlorate, NDMA, hexavalent chromium, and 1,2,3-trichloropropane [1,2,3-TCP]) in groundwater surrounding and downgradient of the Omega site needs to be determined. This task will be accomplished by groundwater monitoring of the new wells installed. EPA has directed OSVOG to perform one round of groundwater monitoring at the OU-2.

d) The remedial action best suited to site conditions needs to be selected to restore the aquifer, prevent the contamination of nearby drinking wells, prevent ongoing contamination migration, and prevent exposure to humans and the environment. This task has as yet to be assigned.

e) Investigation-derived waste (IDW) generated during field activities (e.g., drill cuttings, well development water, well purge water) will need to be properly disposed of in accordance with state, federal, and local regulations.

4) *Specify available resources and relevant deadlines for the study* – Although not complete, investigations have been performed previously at the Omega site. The site history, past investigations, and remediation activities are discussed in detail in the Final On-Site RI/FS Work Plan (Camp Dresser & McKee [CDM], 2003) and the Omega Chemical Superfund Site; Whittier, California: Phase 2 Groundwater Characterization Study Report (Weston Solutions, Inc. [Weston], 2003).

Data obtained in 1988 from site assessment activities, including groundwater and soil sampling conducted by the site owner/operator, Dennis O'Meara, and data from a preliminary assessment conducted by EPA in January 1995, indicated the presence of hazardous substances in subsurface soil and groundwater at the site, including methylene chloride, PCE, and TCE. The presence of these substances and deteriorated underground storage tanks at Omega lead EPA to determine that an imminent and substantial endangerment requiring a removal action existed at Omega. On May 3, 1995 EPA issued an Action Memorandum authorizing a Removal Action involving the following response actions:

- Securing the site;
- Sampling and categorizing hazardous materials;
- Removing hazardous substances and grossly contaminated equipment, structures and debris;
- Sampling surface and subsurface soils and groundwater to determine the nature and extent of contamination;
- Disposing, stabilizing, or treating grossly contaminated soils;
- Grading, capping, and fencing contaminated soil areas.

EPA has divided the Omega Chemical Superfund Site into two operable units: OU-1 and OU-2. OU-1 includes the Omega Chemical facility property and extends a short distance west-southwest to Putnam Street (Weston, 2003). OU-2 surrounds the OU-1 and extends offsite approximately 2.2 miles to the southwest. This DQO describes work to be completed within the OU-2.

As part of the OU-1 effort, EPA entered into a Partial Consent Decree with the potentially responsible parties (PRPs) who had agreed to complete work at the site. This group is known collectively as the Omega PRP Organized Group (OPOG). This Partial Consent Decree was entered into the District Court on February 23, 2001. OPOG agreed to perform a RI/FS, conduct a Non-Time Critical Removal Action, perform a risk assessment, and install groundwater monitoring wells at OU-1, also referred to as the Phase 1A area.

As part of the OU-2 effort, EPA issued an order to another group of PRPs (the Omega Small Volume Group (OSVOG) to complete work at the OU-2, and initiated settlement negotiations with the remaining PRPs.

A record search conducted by EPA revealed ongoing remedial activities at multiple facilities within OU-2. Relevant reports and other documents are available at the LARWQCB and DTSC.

A local water supply well is impacted and continues to be threatened, although it is not known at this time whether the contamination originated at Omega. If no action is taken, drinking water aquifers may become impaired. The OU-2 RI tasks assigned to OSVOG in the latest UAO is scheduled to be completed mid 2005. Additional feasibility studies will be performed by EPA and are likely to be completed in 2006.

Step 2. Identify the Decision

1) *Identify the principal study question –*

The apparent problem at the site is the migration to groundwater of chlorinated solvents and associated attenuation products, and potentially of other compounds. The current decision requires adequate data for use in plume delineation, contamination forensic evaluation, assessment of human health and ecological risk, and recommending a remedial action. The concentrations of these VOC and attenuation compounds are greater than background levels for the area and exceed health-based benchmarks in the vicinity of the site. The principal goals for CH2M HILL are to develop a sufficient amount of data to support selection of an appropriate approach for the site remediation and develop a well-supported Record of Decision (ROD). Achieving these goals includes answering the following study questions:

a) What is the vertical and lateral extent and nature of contamination in groundwater beneath OU-2, and what is the trend in groundwater concentrations?

b) Do contaminants pose an unacceptable potential risk to human health and the environment?

c) Are emergent contaminants (1,4-dioxane, perchlorate, NDMA, hexavalent chromium, and 1,2,3-TCP) present in groundwater surrounding and downgradientof the Omega site?

d) What remedial action will best suit the site conditions to restore the aquifer, prevent the contamination of nearby drinking water wells, prevent ongoing contamination migration, and prevent exposure to humans and the environment?

e) How can IDW (e.g., drill cuttings, well development water, well purge water, and aquifer testing water) be properly disposed in accordance with state, federal, and local regulations?

2) *Define alternate actions that could result from resolution of the principal study question* –The alternate actions for goals defined in (1) above will be, respectively:

a) (1) The nature and extent of groundwater contamination will be based on existing information, including groundwater samples from past cone penetrometer test (CPT) investigations and a limited number of existing monitoring wells. Uncertainties regarding the extent of the plume will remain and changes in concentrations within areas previously characterized by in-situ samples will not be assessed.

(2) Additional well clusters will be installed and monitored at locations within the plume with no permanent monitoring wells at downgradient and lateral edges of the plume to characterize the lateral and vertical extent of contamination. These wells will be available for future monitoring to evaluate changes in contaminant concentrations in groundwater.

b) (1) Additional data collection indicates that there is a risk to human health, (2) no risk, or (3) insufficient data.

c) (1) If emergent chemicals are not present in groundwater, then commonly used technologies for groundwater treatment will be utilized. (2) If emergent chemicals are present, then additional groundwater treatment will be required.

d) Remedial actions that may be considered include no action, natural attenuation, groundwater extraction and treatment system. The site conditions and treatment requirements may require collection of additional data or information to select a remedial action that will best suit the site conditions.

e) Drill cuttings may be disposed as (1) nonhazardous soil in a Class II landfill, or (2) hazardous waste in a Class I landfill. IDW water can be disposed as clean water to a storm drain if no contaminants exceeding maximum contaminant levels (MCLs) or Action Levels (ALs) are present. Wastewater containing contaminants above ALs or MCLs must be treated onsite or disposed at a treatment, storage, and disposal facility (TSDF).

3) Combine the principal study question and the alternative actions into a decision statement –

a) If the new understanding of the nature and extent of groundwater contamination is shown to be significantly different than the current understanding, then a different remedial approach may need to be considered. If the new data are not sufficient to adequately characterize the nature and extent of the contamination, then additional wells will be installed and/or the duration of monitoring extended.

b) If the contaminants at OU-2 pose an unacceptable potential risk to human health and the environment, a remedial action will be recommended. No action will be recommended otherwise. A recommendation for collection of additional data will be made if the risk cannot be fully assessed based on the data collected.

c) If emergent contaminants are present, additional treatment technologies for groundwater may be required.

d) If the selection of a remedial action that will best suit the site conditions cannot be made based on the data available, additional data or information will be collected.

e) IDW water will be treated onsite and discharged as clean if onsite treatment is feasible. If IDW water cannot be treated onsite, it will be disposed at a TSDF. If drill cuttings have not met nonhazardous waste criteria, they will need to be placed in a Class I landfill. If drill cuttings have met nonhazardous waste criteria, they will be placed in a Class II landfill.

4) *Organize multiple decisions* – Based on the answers to the principal study questions, decisions about alternate actions and additional phases of RI/FS activities will be made during the progress of the RI/FS. The resolution of 3(b) and 3(c) may impact 3(a) by requiring that additional data or information be collected.

   a) The updated assessment of the nature and extent of contamination may indicate that the VOC plume has migrated further downgradient or to a greater depth than is currently expected. If so, it may result in the need for additional monitoring wells and extended groundwater monitoring.

   b) If a risk of exposure is determined to exceed human health or ecological criteria, then a remedial action to reduce that risk to an acceptable level will be recommended.

   c) The presence of emerging contaminants in groundwater may necessitate additional site characterization and groundwater treatment technology.

   d) If IDW water can be treated onsite, it will be discharged as clean. If IDW water cannot be treated onsite, it will be disposed at a TSDF. If drill cuttings have not met nonhazardous waste criteria, they will need to be placed in a Class I landfill. If drill cuttings have met nonhazardous waste criteria, they will be placed in a Class II landfill. The range of IDW disposal options was presented and the associated waste profiling specified; evaluation of other disposal options is not required.

Step 3. Identify Inputs to the Decision

The purpose of this step is to identify the information and measurements needed to support the decision statement. The data will be evaluated with regard to the four principal questions of the RI/FS.

1) *Identify the information that will be required to resolve the decision statement* – Based on data uses and availability, the following data are needed:

   a) To resolve the decision statement, the planning team will need contaminant concentration data for groundwater samples from new and existing monitoring wells, and hydrogeological data (including historical) from existing wells, as well as applicable regulatory criteria for the following constituents: VOCs, semivolatile organic compounds (SVOCs), metals, perchlorate, and hexavalent chromium.

b) To resolve the decision statement (b), the planning team will need groundwater and soil concentrations of contaminants listed under (a) and (c), appropriate human health risk and ecological risk criteria, information on exposure pathways, and exposure information.

c) To resolve the decision statement (c), the planning team will need the analytical results for emerging contaminants (1,4-dioxane; perchlorate; NDMA; 1,2,3-TCP; hexavalent chromium) from site monitoring wells as well as applicable regulatory criteria.

d) To resolve the decision statement (d), aquifer hydraulic characteristics derived from aquifer testing will be used to provide information critical to assess contaminant fate and transport and evaluate remediation alternatives. Groundwater elevations and contaminant concentrations in groundwater will be measured to define groundwater flow direction, allow plume tracking over time, and provide calibration data for the numerical model to assess contaminant fate and transport and evaluate remedial alternatives. Analytical results for groundwater samples, including compounds listed under (a) and (c), and additional compounds (nitrate, sulfate, methane, total dissolved solids [TDS], biological oxygen demand [BOD], chemical oxygen demand [COD], pH) will be used to select the treatment technology. Hydraulic conductivity, soil moisture, redox potential, cation exchange capacity, and total organic carbon (TOC) will be used to evaluate contaminant fate and transport.

e) To resolve the decision statement (e), the planning team will need the analytical results for the IDW, both soil cuttings and groundwater, as well as applicable regulatory action levels and screening criteria.

2) *Determine the sources for each item of information identified:* The results from this investigation will provide the necessary information to resolve the decision statement. Data from previous site investigations will be utilized as needed.

a) Lithologic and laboratory analytical data from samples collected at new and existing monitoring wells.

b) Soil and groundwater analytical data collected during this and previous investigations as well as information on exposure pathways.

c) Laboratory analyses of emerging compounds from groundwater samples collected from the new and existing wells.

d) Data collected under (a), (b), and (c), aquifer test results, regulatory requirements, cost analysis.

e) Laboratory analysis results for samples of IDW water and soil.

3) *Identify the information that is needed to establish the action level* – Action levels will be generated in the risk assessment using EPA guidance.

a) The regulatory action levels include California and federal drinking water standards, ALs in California, and California Public Health Goals (PHGs) (Table A-1 in the main text of this QAPP). Method detection limits and historical concentrations, as appropriate, will be used for unregulated drinking water compounds.

b) A risk assessor will evaluate human health and ecological risk; specific action levels will not be recommended.

c) California ALs will be applied.

d) If groundwater treatment is required, discharge options will be guided by MCLs, California ALs, California PHGs, Los Angeles Basin Plan Water Quality Objectives, National Pollutant Discharge Elimination System (NPDES) Permits, California Toxic Rules, and South Coast Air Quality Monitoring District Permits.

e) For IDW soil: 40 Code of Federal Regulations (CFR) Section 261.24, 22 California Code of Regulations (CCR) Section 66261.24, and waste acceptance criteria for offsite nonhazardous waste TSDF. For IDW water: California Toxic Rules (40 CFR Section 131.38), 22 CCR Section 64431 (Drinking Water Standards); Department of Health Services (DHS); Office of Environmental Health Hazard Assessment (OEHHA); and best professional judgment.

4) *Confirm that appropriate measurement methods exist to provide the necessary data* – The appropriate methods have been identified to meet project needs and are shown in the QAPP.

Step 4. Define the Boundaries for the Study

1) *Specify the characteristics that define the population of interest* –

a) Concentrations of chlorinated solvents and their degradation products, and other parameters, including VOCs, SVOCs, pesticides/PCBs, cyanide, perchlorate, and metals in groundwater within shallow unconsolidated sediments.

b) Same as (a). The groundwater samples will be collected following a systematic rather than statistical sampling design.

c) Concentrations of emerging contaminants in groundwater within shallow unconsolidated sediments.

d) Impacted groundwater within shallow unconsolidated sediments.

e) DW soil and water containerized in roll-off bins, tanks, 55-gallon drums, and other storage containers.

2) *Define the spatial boundary of the decision statement –*

a) Define the geographical area to which the decision statement applies – The boundary of OU-2 is the extent of the contamination in groundwater. One objective of the RI/FS (principal study question a) is to determine the extent of the spatial boundary. This geographical area applies to all principal study questions.

b) Divide the population into strata that have relatively homogeneous characteristics –For all the principal study questions, the contaminated aquifer may be considered one stratum.

3) *Define the temporal boundary of the decision statement –*

a) Determine the timeframe to which the decision statement applies – For principal study questions (a), (b), and (c), the timeframe is 2 years, the duration of the project. For principal study questions (d) and (e), the duration if indefinite because the liability associated with the remedy and IDW disposal extends into the future.

b) Determine when to collect data - The anticipated duration of the RI/FS is 2 years (all principal study questions).

4) *Define the scale of decision-making* – The scale of decision-making will be limited to the OU-2 area (the same geographic boundary).

5) *Identify practical constraints on data collection* – The sampling locations and schedule may depend on site access, permitting, and right-of-way constraints. For all principal study questions, there are practical funding limitations imposed by Congressional appropriations. The decisions and professional practices will be based on the current scientific understanding of contaminant fate and transport, adverse effects of contaminants on human health and environment, and treatment of contaminated media.

Step 5. Develop a Decision Rule

1) *Specify the statistical parameter that characterizes the population of interest*

   a) Sample analysis reports will be compared to action levels. Each value, not a statistical parameter such as mean concentration, will be evaluated against the action levels.

   b) Sample analysis reports will be compared to action levels on a point-by-point basis.

   c) Sample analysis reports will be compared to action levels. Each value, not a statistical parameter such as mean concentration, will be evaluated against the action levels.

   d) The full range of concentrations will be used semi-quantitatively in the evaluation of remedial alternatives.

   e) Sample analysis reports will be compared to applicable criteria on a point-by-point basis to characterize IDW soil for disposal and IDW water for treatment and discharge.

2) *Specify the action level for the study –See Step 3, Item (3).*

3) *Develop a decision rule (an "if…then…" statement) –*

   a) If an analytical result is greater than an action limit, then the sampling location can be included in OU-2 and may warrant further investigation.

   b) If the assessment of risk concludes the contamination at OU-2 poses an unacceptable risk to human health and/or the environment, a remedial action will be recommended.

   c) If emerging contaminants are detected, remedial alternative selection will include appropriate treatment technologies.

   d) If the collected data allow for clear identification of remedial alternatives, the alternative selection will be developed; otherwise, additional data or information will be collected.

   e) If waste soil profiling indicates the results meet nonhazardous waste criteria, the IDW soil will be shipped to a Class II landfill; otherwise, it will be transported to a Class I landfill. If waste profiling for IDW water indicates it meets regulatory requirements, it will be treated and discharged onsite; otherwise, it will be send to a TSDF.

Step 6. Specify Tolerable Limits on Decision Errors

Tolerable limits on decision errors, which are used to establish performance goals for the data collection design, are specified in this step.

1) *Determine the range of the parameters of interest* – The available historical range of the parameters of interest (for principal study questions a, b, c, and d) is known for a portion of OU-2 only. Concentrations of chlorinated hydrocarbons in groundwater ranged from nondetect to tens of thousands of micrograms per liter (μg/L). Concentrations of perchlorate were less than 7 μg/L. Part of principal study question (a) is to determine the range of contaminant concentrations. The historical range of contaminant concentrations in IDW (principal study question e) was not known at the time of preparation of this document.

2) *Identify the decision errors and choose a null hypothesis* – For principal study questions a through d: The DQO guidance prescribes the identification of the null hypothesis and associated decision errors for determining the number of random samples and the locations to attain a given level of confidence with the spatial distribution. Because samples will be collected at systematically selected locations, statistical decision errors cannot be defined. However, project error tolerances are defined in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters in Section A.4 of this QAPP. Analyte-specific accuracy and precision ranges are shown in Table A-2 of this QAPP. The project completeness goal is set at 90 percent. The laboratory data will be evaluated against PARCC requirements as outlined in the QAPP. Possible decision errors will be considered tolerable when data meet stated PARCC goals. For principal study question e, for IDW soil, guidance published in EPA Publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, will be followed (see Step 7, Item 3). For IDW water, mixing is expected to occur while each Baker tank is being filled, thus providing a well-mixed, homogeneous condition for sample collection.

3) Specify a range of possible values of the parameter of interest where the consequences of decision error are relatively minor – Not applicable.

4) Assign probability values to points above and below the action level that reflect the tolerable probability for the occurrence of decision errors – Applies to all principal study questions: Because sample locations are predetermined, probability values cannot be assigned. Instead, error tolerances are defined in terms of the PARCC parameters and are explained in Section A.4 of the QAPP. Needed project accuracy and precision ranges are shown in Table A-2 of the QAPP for the individual analytes. The completeness goal for the project is set at 90 percent.

Step 7. Optimize the Design

1) *Review the data quality objective (DQO) outputs and existing data*

   a) The results will also be compared to historical data and to regulatory action levels (e.g., state and federal MCLs, California ALs, PHGs) as per the objectives described above. Discrete groundwater sampling and screening-level laboratory analysis of the discrete samples will be used to select the screen depth intervals of the new monitoring wells.

   b) Existing (i.e., historical) data will also be included in the risk assessment. The analytical results for the discrete-depth groundwater samples and IDW samples will not be used in the risk assessment.

   c) The results will also be compared to historical data and to regulatory action levels (e.g., California ALs) as per the objectives described above.

   d) Areally averaged concentrations in groundwater will be used to estimate the average influent concentrations, which then can be used for the feasibility evaluation and treatment unit process design.

   e) The waste profiling results will not be compared to past IDW results. For proper disposal, the waste profiling results will be compared to applicable screening criteria, federal and California hazardous waste action levels, and facility-specific waste acceptance criteria.

2) *Develop general data collection design alternatives –*

   a) None anticipated. Sampling will be done from fixed well locations which are based on professional judgment, so there are no alternatives.

   b) None anticipated. Samples will be collected at locations selected as part of principal study questions a and c.

   c) None anticipated. Sampling will be done from fixed well locations which are based on professional judgment, so there are no alternatives.

   d) None anticipated. The feasibility study will use areally averaged results from samples collected at fixed well locations which are based on professional judgment, so there are no alternatives.

   e) Representative sampling of IDW soil can be achieved either by averaging the results of separate samples collected, or by collecting the samples, compositing first, and then analyzing the composited sample. The IDW water is expected to be relatively well-mixed as holding containers are filled. Given that the constituents are expected to be in the dissolved phase (not in nonaqueous phase), a single sample per container should be representative of the wastewater.

3) *For each data collection design alternative, select the optimal sample size that satisfies the objectives* - None anticipated for principal study questions a through d; the sample size is based on professional judgment.

For DQO e, for IDW soil, the optimal sample size (see table below) is based on the requirements listed in EPA Publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

Volume (CY)	**Minimum No. of Subsamples/Aliquots**	**Comments**
<10	2	1 sample from each half
10 to 20	3	1 sample from each third
20 to 100	4	1 sample from each quarter
>100	1 per 25 CY	1 sample from each 25-CY portion

Note that roll-off bins are each 10-cubic yard (CY) bins and more than one roll-off bin may be grouped together for composite sampling.

For IDW water, one sample per 20,000-gallon tank is expected to be adequate.

4) *Select the most resource-effective data collection design that satisfies the DQOs* –

The proposed groundwater monitoring well locations were selected to fill data gaps in areas where the extent of the groundwater contamination is not known. Discrete groundwater sampling will be used to select a representative well screen depth and minimize the number of wells necessary.

a) All historical and new data will be used.

b) Same as (a).

c) Same as (b).

d) Attempts will be made to separate relatively clean IDW from contaminated IDW. Compositing of samples from segregated IDW will minimize the number of laboratory analyses.

5) *Document the operational details and theoretical assumptions of the selected design in sampling and analysis plan* – The data collection program, including sampling rationale, is presented in the FSP (EPA, 2004).

ARCADIS

Appendix B

Laboratory QAPP

ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

Revision 3

Effective Date: March 20, 2004

3283 Walnut Avenue
Signal Hill, CA 90755
PHONE: (562) 989-4045
FAX: (562) 989-4040
FAX: (562) 989-6348

General Manager: ______________________ Date: 3/10/04
Edgar P. Caballero

Laboratory Director: ______________________ Date: 3/11/04
Eduardo Rodriguez

QA Officer: ______________________ Date: 3/11/04
Glen Gesmundo

ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

TABLE OF CONTENTS

APPENDICES

ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

1 QUALITY ASSURANCE ORGANIZATION

1.1 OVERVIEW

ADVANCED TECHNOLOGY LABORATORIES (ATL), a division of Environmental Treatment and Technology, Inc., (ETT), is a full service analytical laboratory, which provides technical and laboratory support for commercial and regulatory agencies. Clientele include consulting, engineering firms, city/local, various state agencies, and others clients requiring analytical services.

It is the purpose of this document to describe ATL's program to assure that analytical data generated by ATL are of a known quality and a known level of confidence. The policies and procedures in this document have been developed to meet NELAC and/or ELAP requirements as well as project specific requirements.

1.2 QUALITY ASSURANCE POLICY AND OBJECTIVES

ATL is committed to provide the client with analytical data of a known and documented quality sufficient to meet its data quality objectives in a reasonable time frame and at a fair cost. The reliability of the data generated by ATL is measured by the close adherence to quality control, qualifications and experience of personnel, and the organization's commitment in maintaining data integrity, validity, and usability.

The following statements describe the quality of the data required to be usable for the client.

1.2.1 Data Quality Objectives (DQOs)

Data quality objectives are used to assess the minimum data quality to ensure that the amount, type, and quality of data obtained during analytical processes are adequate to support and draw valid conclusions with a known level of confidence. DQOs also support specific decisions, and planning relative to remedial and regulatory actions.

The data quality objectives process facilitates the determination of the following:

1.2.1.1 Information and data requirements for the specified project.

1.2.1.2 Where, when, and how to collect samples to allow the most precise measurements as possible.

1.2.1.3 Laboratory Quality Assurance/Quality Control required to defend the data quality.

1.2.1.4 Required number of observations.

1.2.2 DQOs are usually expressed in terms of:

1.2.2.1 Precision

It is defined as the degree to which a set of observations or measurements of the same property obtained under similar conditions conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

1.2.2.2 Accuracy

It is defined as the degree of agreement between an observed value and an accepted reference or true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. Accuracy may be assessed through the use of blanks, known quality control (QC) samples, and matrix spikes.

1.2.2.3 Representativeness

It is the degree to which data accurately represent a particular characteristic of a population or environmental parameter. It is a qualitative parameter that is most concerned with the proper design of the sampling program.

1.2.2.4 Completeness

It measures the amount of valid data obtained from a measurement system compared to the expected amount. Usually reported as a percentage.

1.2.2.5 Comparability

It measures the confidence in comparing results in one experiment with the results of the same experiment on different samples. It is also demonstrated through the participation in round-robin performance evaluation studies and the use of standard reference materials that are traceable to the National Institutes of Science and Technology (NIST) and EPA.

1.2.3 Quality Assurance/Quality Control (QA/QC) Program

ATL's QA/QC program ensures that analytical measurement systems are maintained within acceptable limits and reproducibility. Specific sections of this QA/QC plan address various QA/QC procedures that are used to generate valid and defensible data. Some elements of the QA/QC program include:

1.2.3.1 Preventive Maintenance

All analytical instruments and equipment are checked and calibrated by the analyst each time the instrument or equipment is used. In addition, the instrument or equipment is rechecked and recalibrated depending on the usage either on a time basis or sample basis according to the Standard Operating Procedures (SOPs). Besides daily checks, a schedule of preventive maintenance is kept to reduce the likelihood of total failures. Instrument calibration and precision statistical records are kept to insure stability and reproducibility.

1.2.3.2 Quality Assessment Procedures

ATL employs quality assessment procedures to detect problems through data assessment and establish corrective action procedures that keep the analytical process reliable. Data validation is accomplished at all levels. Data reporting procedures start at the laboratory bench level. Supervisors, QA Officer, and Laboratory Director and/or his designated signatory personnel do the review of the final data package report.

1.3 ORGANIZATION AND PERSONNEL

1.3.1 Organization

Appendix A shows the organizational structure of the analytical services within Advanced Technology Laboratories. Appendix B shows a table of Key Personnel along with their assignments, responsibilities, education, and years of applicable experience.

1.3.2 QA/QC Roles and Responsibilities

Specific QA/QC responsibilities are summarized as follow:

1.3.2.1 General Manager

The General Manager has the overall responsibility for the general operations of ATL, including but not limited to Administration, Business Office, Regulatory Affairs, and Technical Operations.

1.3.2.2 Technical Support Manager

The Technical Support Manager has an overall responsibility for the management of support departments including QA/QC, IT/LIMS, Health and Safety, Document Control and Regulatory Affairs. The Manager is responsible for:

- Supervising and administering the quality assurance program and providing an environment, in which quality work is produced.
- Ensuring that all general and client-specific quality assurance requirements are strictly followed.
- Resolving the approval/rejection of deliverable client sample data package and/or reports.

1.3.2.3 Laboratory Director

The Laboratory Director is directly involved in the day-to-day operation such as scheduling, staff training, QAPP implementation, technical peer reviews, etc. of their respective group. The Laboratory Director is responsible for:

- Enforcing the QA/QC procedures and requirements within the laboratory.
- Ensuring that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Recommending process improvements and corrective actions.
- Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.

1.3.2.4 Quality Assurance Officer (QA Officer)

The QA Officer reports to and is responsible directly to the Technical Support Manager for all matters on laboratory quality assurance. Specific roles include:

- Responsible for implementation and monitoring of the laboratory quality assurance program.
- Ensuring that all data generated is scientifically sound, legally defensible, and of known precision and accuracy.
- Monitoring the QA plan on a periodic basis to ensure compliance with the QA objectives of the laboratory.
- Developing and implementing new QA procedures within ATL to improve data quality.
- Conducting audits and inspections of all departments on a periodic basis; reporting the results of the audits to the General Manager, Laboratory Director, and Supervisors; and implementation of corrective actions to ensure compliance with the QA plan.
- Coordinating the analysis of performance evaluation (PE) samples for all analytical departments on a periodic basis.
- Evaluating the results; reporting the results to the General Manager, Laboratory Director, and appropriate Supervisors; and applying corrective actions as needed.
- Establishing and maintaining statistical and data records that accurately reflect the quality assurance performance of all analytical departments.
- Maintaining and overseeing the master sources of all SOPs, training logs, and completed/full laboratory notebooks.
- Serving as the in-house client representative on all projects inquiries involving data quality issues.
- Maintain and update the QA Program Plan on an annual basis (minimum).

1.3.2.5 Laboratory Supervisor(s)

The Laboratory Supervisors are directly involved in the day-to-day such as scheduling, supervision of laboratory procedures and reporting of results, staff training, etc. of their respective departments. The Laboratory Supervisors are responsible for:

- Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization.
- Monitoring validity of the analyses performed and data generated in the laboratory to assure reliable data.
- Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff.
- Recommending process improvements and corrective actions.

1.3.2.6 Project Coordinators (PC)

The Project Coordinator has the overall responsibility for the technical completeness, cost control, and adherence to schedules. Specific responsibilities include:

- Implementing the appropriate quality procedures for project activities in support of the QAPP.
- Communicating with the Laboratory Director and/or QAO relating to QA/QC activities.

1.3.2.7 Sample Control Officer

The primary responsibility is to manage the sample control section. The Sample Control Officer is responsible for overseeing sample log-in, proper documentation, sample tracking, sample storage, sample disposal/return, and coordination and scheduling of sampling programs. Other responsibilities include client contact, and assists with contract administration.

1.3.2.8 Document Control Officer

The Document Control Officer is responsible for the filing, retrieval and storage of the reports.

1.3.2.9 Staff (Chemists, Technicians and Support Personnel)

Every ATL laboratory personnel are responsible for the quality of work that is consistent with the requirements established by the ATL management. The laboratory personnel plays an active role in the ATL Laboratory quality program and whenever possible, make recommendations regarding the process improvements and corrective actions. Specific job descriptions are available in the Human Resource File.

The ATL personnel responsibilities include but not limited to:

- Providing the management and the QAO with the immediate notifications of the quality problems by submitting Non-Conformance forms.
- Identifying and carrying out the approved corrective actions within their respective activities and specialization.
- Participating in the training program (including reading SOPs and QA Manual, MDL determinations and Accuracy and Precision data).
- Following QA/QC criteria for all program requirements.
- Correct reporting of sample results and QC samples.

1.3.2.10 Work Cell

ATL defines a work cell as a group of analysts and sample prep technicians within the inorganic and organic section (see organizational chart). These work cells work together to perform the method analysis. Analysts perform the instrumentation analysis while sample prep technician do the sample preparation. The members of this group and their specific function within the work cell are documented in each method demonstration of capability (DOC) for applicable methods.

1.4 PERSONNEL TRAINING

The ATL training program is designed to ensure that all personnel are qualified and properly trained to perform all required tasks. The training program also provides that all pertinent health and safety issues are covered on a quarterly basis. It also provides for periodic evaluation of each staff member's skills by performance evaluation samples.

Initial training includes reading and understanding the method, Standard Operating Procedure (SOP) comprehension, standards preparation, method set-up, accurate reporting, correct and accurate QA/QC and routine instrument maintenance. Trainees are given supervised training by the department supervisor or by designated chemist(s) who already completed the initial proficiency. Once the initial training is complete, the chemist's initial proficiency demonstration can be determined from accuracy and precision data, testing of the SOPs, and demonstration through performance evaluation (PE) samples. All results are documented into the personnel training log by the QA Officer.

The QA Officer conducts internal "blind" performance evaluation samples as part of the training program. These "blind" performance evaluation samples are submitted to the analyst after the initial training has been completed and on an annual basis (more frequent if necessary). All results from the internal performance evaluation samples are evaluated for accuracy. The results are graded on a "PASS/FAIL" system. All analytes that "fail" must have a corrective action and a subsequent sample will be re-submitted.

The chemist must also submit "Accuracy and Precision" data by preparing and analyzing 4 replicate reference samples containing target analytes in a clean matrix. The accuracy and precision data is calculated from 4 Laboratory Control Samples (LCS) that are spiked with a secondary source standard. The results are evaluated for accuracy (average recovery) and precision (standard deviation of the recovery). The results are evaluated against method or in-house limits. If the data does not meet the criteria, then a corrective action is initiated. Once the problem is corrected, a new precision and accuracy data set is collected and evaluated. All forms and raw data is filed in the training log.

As part of the chemist's training, each chemist and technician must read the QA Manual whenever there is a revision to the manual. Each chemist must answer some questions and sign the questionnaire as documentation to reading the QA Manual. The questionnaire also allows the chemist to ask questions and give updates for the next revision.

Continuing (supplemental) training includes development of SOPs, learning the importance of documentation, the understanding of meeting QA/QC criteria and quality. Supplemental training can be obtained from reading different procedures, instrument manuals and related literature. Knowledge regarding methods and instrumentation can also be obtained from external training by agencies and manufacturers. Copies of completion certifications are kept in the chemist's training file.

The QA Officer maintains the training records. All employees' training records are updated on a monthly basis to reflect current training qualifications. The oversight of the training program is performed by the QA Officer, the department supervisors, and the Laboratory Director.

According to ATL's Employee Handbook, under section "Personal Conduct", disciplinary action, which may include discharge, will be taken for offenses such as: falsifying data and/or company records, violation of safety rules, breach of security and/or confidentiality, commitment of financial or legal resources without authorization of company officer." When a new employee begins work at ATL, they are required to read the Employee Handbook and an "Ethics and Data Integrity Agreement". Each document requires the employee to sign an acknowledgement memo stating that they have read and understood each item that was submitted to them.

2 FACILITIES AND EQUIPMENT

2.1 LABORATORY LAY-OUT

The facilities have two buildings each having one main entrance that is controlled by card access. ATL personnel monitor the entrance at Suite 3283 during business hours. All visitors, guests, and other non-laboratory personnel are required to sign the guest registry. All visitors are escorted within the facility.

ATL occupies several suites in a commercial business park. Suite 3283 includes the administrative offices, storage facility, Classical Chemistry department and Organic Prep. Suite 3275 includes the Volatile department, Semivolatile department, ICP group, AA group, Sample Control, Project Coordinator(s) and some offices. Appendix C shows ATL laboratory layout.

2.2 MATERIAL PROCUREMENT AND CONTROL

2.2.1 Supplies Management

To assure the quality of supplies used for various laboratory analyses, the following items are taken into account (Refer to SOP for Material Procurement for more details):

2.2.1.1 Materials, reagents, standards, solvent, and gases are carefully selected to meet specifications defined in the method analyses. Each new supply of these items are verified for their performance capabilities, freedom from impurities that interfere with the analysis, and background levels measured to check the degree of contamination.

2.2.1.2 Materials are dated upon receipt to establish their order of use, "as first in, first out basis," and to minimize the possibility of exceeding their shelf-life. Pertinent information such as name of supplier, lot number, expiration date, concentration, date opened, date received, and date expired into the chemical inventory logbook. Chemicals are then labeled with a chemical inventory code, date received, date opened, and date expired sticker.

2.2.1.3 Stock and working standards solutions are prepared fresh as often as required by their stability. These are checked for signs of deterioration (e.g., formation of precipitates, discoloration, and changes of concentration through calibration results). Standard solutions are properly labeled as to name of solution, concentration, solvent, date of preparation, and initial of who prepared. Standard preparation is documented in the standard preparation logbook. The standards are stored in places where these are protected from degradation and contamination.

2.2.1.4 Acids and bases are segregated in terms of storage. Various types of solvents are stored in flammable storage cabinets. Dry chemicals used for inorganic and organic analyses are stored in the chemical storage cabinet. Incompatible chemicals should not be stored together for safety reasons. Primary standards and working standards prepared for organic analysis are stored in the standard refrigerator/freezer.

2.2.1.5 Services such as electricity, air, gas, and vacuum are checked for proper specifications for efficient and reliable performance of the instruments.

2.2.1.6 Distilled water for volatile and semi-volatile organics is purchased from a commercial water distributor. Distilled water for wet chemistry analyses are obtained from water filter through resins (Type II water). The resistivity of the distilled water must be greater than 1 megohm-cm. The laboratory conducts daily checks of the reagent water by monitoring the conductivity and the pH. The conductivity must be equal to or less than 1 µhmo/cm and the pH does not have a specified range. Analyses such as metals, mercury, Ion chromatography, TOX/TOC utilizes Type I water. The resisitivity of the Type I water must be greater than 10 megohm-cm. The conductivity must be less than 0.1 µmho/cm and the pH does not have a specified range.

2.2.2 Subcontractors

Samples can be subcontracted to another laboratory, if ATL is not approved to perform a particular test or if the lab is not able to complete analysis of required tests. These samples must be subcontracted to an approved outside laboratory. A client may request that the subcontract laboratory have a certain approval or certification.

All data from subcontract laboratories must meet all project requirements. Samples must be re-analyzed if specified project requirements are not met. The final report is reviewed for typographical and technical errors.

2.2.3 Equipment Management

Information on the actual performance of the equipment is obtained before purchase request for a piece of equipment is made. The availability of the supplier's service to install and test it against specifications as part of purchase price is also considered. When first installed, an internal calibration of the instrument is performed using the manufacturer's manual. Analytical reference standards are analyzed for qualitative and quantitative checks on the instrument performance during the sample run. Routine preventive maintenance of the instruments/or equipment is done on a regular scheduled basis.

2.2.4 List of Instrumentation - Appendix D lists the various instrumentation and equipment.

2.2.5 Preventive Maintenance Activities and Schedules

Instruments are maintained according to the Standard Operating Procedures using the manufacturer documentation. Repairs are conducted as needed, either by manufacturer representatives or by in-house personnel. Routine maintenance (lamp replacement, etc.) is conducted as needed to maintain instrument integrity.

Critical equipment and instrumentation are maintained on a scheduled basis to minimize the downtime of measurement systems. Maintenance logbooks (hard bound) are kept for each equipment. All maintenance (routine and unscheduled) is recorded by the analyst. Each entry must contain at the minimum: date, event/problem, corrective action, proof of conformance, and initials.

2.2.6 Waste Disposal

Laboratory generated wastes are classified into various waste streams and are disposed according to the local, state, and federal regulations.

2.3 LABORATORY RESOURCES

When large or new projects are scheduled to arrive at the laboratory, the project coordinator or client service person should request all pertinent sample information from the client. This includes number of sample(s), matrix types, QC requirements, turn-around-time, data package requirements and expected sample delivery schedule.

A meeting of all key personnel is called to distribute the sample information for the project. Allocation of personnel, laboratory resources and materials are distributed for the type of work and the expected turn-around-time. Questions are given to the project coordinator or client service person. They in turn contact the client to clarify any laboratory questions.

3 SAMPLING HANDLING AND CHAIN-OF-CUSTODY (COC)

3.1 SAMPLE COLLECTION

Sampling is done by outside contractors mostly by clients, i.e., environmental engineering consultants, and government contractors.

3.2 SAMPLE PREPARATION

ATL prepares all sample containers, including trip or transport blanks, and used according to the requirements stated in 40CFR, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants. Sample holding time, preparation, and analyses follow the specified method requested for analysis.

3.2.1 For volatile sample analysis, an aliquot of the solid sample is taken first for analysis. The remaining samples are then prepared for the rest of the required parameters. A separate vial or container with zero headspace is used for liquid samples

3.2.2 The frequency of QC samples within a given batch of a similar matrix is defined in the project QA/QC requirement. Specific QA/QC criteria for the QC samples such method blanks, matrix spike/matrix spike duplicate, laboratory control sample, field blank, etc. are defined in the method used for analysis and/or the project QA/QC requirement.

3.3 SAMPLE TRACKING

Samples received at ATL are considered as physical evidence and are handled according to the procedural safeguards established by EPA.

3.3.1 Standard Operation Procedure (SOP)

The Sample Control Login SOP describes in detail how samples are received, the step-by-step sample log-in process, how samples are tracked from receipt to completion, and the overall responsibilities of the Sample Control Officer.

3.3.2 Sample Verification

A sample custodian receives a sample shipment or delivery. An alternate person is designated to receive samples if the Sample Control Officer is not available. The following procedures are taken during the process.

3.3.2.1 Coolers should be opened under a fume hood, wearing the appropriate personal protection equipment.

3.3.2.2 The cooler temperature is taken and recorded on the project folder. The acceptance criteria for the cooler temperature are 2 - 6 degrees Celsius.

3.3.2.3 Presence or absence of custody seals or tape on the shipping containers and the condition of the seals (i.e. intact, broken, etc.) are noted on the chain of custody.

3.3.2.4 If the COC is not available with the samples, a Sample Control Personnel or Client Service person must call the client to request the COC.

3.3.2.5 The COC accompanying the samples is signed and dated. A copy of the COC is kept in the project folder.

3.3.2.6 The Sample Control Personnel must check agreement between client's sample labels, ATL's labels and COC. If there are any discrepancies, then client must be notified immediately of any problems.

3.3.3 Sample Login

3.3.3.1 Login begins with assigning an ATL Laboratory workorder number from ELIMS (Environmental Laboratory Information Management System). This is a six digit sequential number that identifies the samples by batches.

- Within each workorder, the samples are given an individual number starting at 001A. A sample is defined as a unique client ID and unique bottle/preservation. A workorder with 10 samples will be labeled as 047100-001A / 010A.

- For those samples that have the same client ID and a unique bottle/preservation must have a individual fraction assigned to each bottle. A sample with 3 fractions will be labeled as 047101-001A / 001C.

- For VOA vials, the ELIMS will assign multiple containers with 1 of 2, 2 of 2, etc.

3.3.3.2 A Master Sample Log is generated from the ELIMS. This contains the following information for every set of samples received: client name, project name, date of collection and receipt, matrix of the samples, the analyses requested, client sample ID, preservation, container type, due date, selected analyte list, initials of Sample Control personnel and Status (Turn-Around-Time). The log is printed out every day and is placed into a 3-ring binder. The log is then permanently bound with 5 days after the quarter ends. All old logbooks will be stored in the QA Office.

3.3.3.3 Other login information includes: information for specific sample handling, QA/QC, detection limits are documented in the "Comments" section of the sample login of ELIMS.

3.3.3.4 A sample-receiving checklist is filled out on the ELIMS. The checklist documents the carrier name, cooler temperature, shipment/sample condition questions and Sample Control personnel initials. A printout of the checklist is placed into the project folder.

3.3.3.5 A project folder is created for each WorkOrder. A WorkOrder COC generated by ELIMS is printed and placed into the plastic sleeve at the front of the project folder. Also , a printout of the WorkOrder Summary is placed inside the project folder for the Project Coordinator review.

3.3.4 Sample Labeling

After the samples have been logged into the ELIMS, a sample label is printed with the client ID, ATL laboratory number, date received and the barcode. The label is then affixed to the appropriate container.

3.3.5 Chain of Custody (COC)

Chain-of-custody procedures are used for a variety of samples in the laboratory. The purpose is to establish a detailed documentation of all transactions in which the samples are transferred from the custody of one individual to another. These procedures are used from the point at which the samples are collected to the opening of the samples in the laboratory, and the subsequent disposition of unused samples. A COC form documents sampling efforts and sample transfer from the field to a testing facility or between testing facilities. An example of an ATL chain-of-custody form is shown in Appendix E.

3.3.6 An ATL COC form is used for a set of samples received without a client's COC or equivalent form. It is used to document any sampling and analysis information contained on the sample label or as provided via FAX or mail by the client.

3.3.7 If samples need to be sent out to a subcontractor, a new ATL COC form, cross-referencing the original COC, is generated to accompany samples delivered outside the laboratory.

3.3.8 The traceability of the samples that are transferred to or from the laboratory is tracked by the use of the ATL laboratory number (batch) and client sample identification. These are monitored from the point of acquisition by the laboratory through the sample preparation, analysis, data reduction, data validation, final report generation, and sample disposal.

3.3.8.1 Sample traceability throughout the laboratory is achieved by using the ELIMS Sample Tracker.

- When the samples are given to the chemist, ELIMS records the date, time, samples, the name of the chemist the samples were transferred to and the Sample Control personnel initials.
- When the samples are returned to Sample Control, the date, time, samples and the location of the walk-in refrigerator are recorded.
- When samples are transferred to Sample Disposal, ELIMS records the date, time, samples, transfer location and the Sample Control personnel initials.
- Samples that are consumed, broken, disposed or returned to the client are recorded by ELIMS with the date and time of the transaction.

3.3.8.2 In the Sample Preparation Areas, sample traceability is documented on the organic extraction and metal digestion logbooks. After the samples have been prepared, the extractor or digestor gives the extracts and an extraction printout from ELIMS to the analyst.

3.3.8.3 Sample traceability continues through the analysis, data reduction, data validation, final report generation, and sample disposal by the use of the ATL laboratory number. All result templates, folders, invoices, and final reports document the ATL laboratory number for all samples.

3.4 SAMPLE STORAGE

3.4.1 For Samples

Samples received by the laboratory are placed into 3 walk-in refrigeration units, which are restricted to authorized laboratory personnel. Samples for volatile analysis are kept in a separate refrigerator. The temperature of the refrigerators is monitored for the acceptable temperature range.

3.4.1.1 Acceptable refrigerator temperature range is 4 °C ± 2 °C.

3.4.1.2 Temperature of the sample storage refrigerators is monitored daily for acceptable working temperature range using an NIST traceable thermometer. The thermometer is calibrated against an NIST reference thermometer every twelve months. (See Section 6.1.2 for more details.)

3.4.1.3 The SOP for Thermometer Calibration describes the calibration of thermometers. Electronic thermometers are rechecked daily to confirm the stability of the calibration.

3.4.1.4 Corrective actions are taken if the refrigerators malfunction or the temperature is out of acceptable range. A Non-Conformance Form is submitted to the QA Officer following the corrective action.

3.4.1.5 If a client submits samples to the laboratory, which could or/will, go to litigation, the laboratory can make provisions to store the samples into a separate walk-in refrigerator. The refrigerator can be locked and secured until a written notice is received from the client. The client must approve transferring or disposal of samples. A written authorization must be faxed to the laboratory confirming status of samples. All documentation must be placed into the project folder.

3.4.2 For Extracts, Digestates and Leachates

Once the sample has been processed, the extract, digestate or leachate must be stored according to method specified conditions. The digestates for metals are stored at room temperature until sample analysis. The digestates for mercury are analyzed on the same day as the digestion. Organic extracts can be stored up to 40 days at 4 ° C(± 2 °C). The extracts must be stored in a separate refrigerator from that housing the analytical standards. The leachates (from tests such as TCLP) can be stored prior to the preparation stage or the analytical stage. Each has a holding time and/or preservation requirements. See method for details.

3.5 SAMPLE DISPOSAL

Unused and remaining portions of the samples received in the laboratory are kept for at least 45 days upon receipt (or as stated by the project requirements). A sample disposal fee is charged if client prefers the laboratory to dispose them. Laboratory sample disposal is in accordance with the local, state, and federal regulations.

Laboratory waste is segregated according to hazard class. Non-hazardous waste is disposed of in one of two ways: non-hazardous aqueous waste is neutralized and disposed with excess water. Non-hazardous soil samples are disposed of in the regular trash.

Hazardous wastes are segregated by organic and inorganic type material. This material is packaged in steel drums. Oil samples are also segregated into steel drums for recycling. Waste solvents and solvent-based extracts are stored in steel drums for recycling. A licensed disposal company performs all handling of hazardous waste.

3.6 SAMPLE CONTAINERS PREPARATION

To ensure sample integrity, steps are taken to minimize contamination from the containers by lot analyses verification of cleanliness. If the analyte(s) to be determined is organic in nature, the preferred container is made of glass. If the analyte(s) is inorganic, then the container is plastic. Sample containers supplied to the clients are either commercially obtained as pre-cleaned containers or verified clean by ATL lab analyses. Certificate of analysis is accompanied with the various types of sample containers purchased commercially.

The laboratory provides chemical preservation in sample containers for clients requesting containers ahead of time before collection.

4 DOCUMENT CONTROL

A document control program is established to ensure that all documents issued or generated at ATL are accountable and traceable. Listed below are the general guidelines of the document control program.

4.1 LOGBOOKS/NOTEBOOKS

4.1.1 Documentation Policy

The general guidelines for documentation of any records or entries are:

4.1.1.1 Legibility: All entries must be legible. Printing is preferable, but writing is acceptable for all characters, including notes.

4.1.1.2 Recording Entries: All entries are made using indelible ink pens, preferably blue or black.

4.1.1.3 Review all forms before entering information.

4.1.1.4 The originator(s) of all entries must be identified by initial(s) or signature(s). In most cases, there are specific places on the data sheet for initials to identify the originator of entries or groups of entries.

4.1.1.5 All blanks with no data must contain a diagonal line or "Z" out and initialed and dated.

4.1.1.6 The use of abbreviations is kept to a minimum. Only nationally accepted abbreviations (e.g., mg/Kg, mL, µg/Kg) and chemical formula abbreviations (e.g., NaOH, HCl) may be used without further clarification. Other abbreviations can be used providing the abbreviation can be traced to the corresponding abbreviation explanation.

4.1.1.7 All mistakes are corrected at the time the error is discovered. Cross out with a single line so as to remain legible. **Do not** erase, write over, or use correction material. Each cross out is initialed and dated. If the reason for the change is not obvious, then the reason must be stated.

Note: If there is insufficient space for all or part of the correction information, enter a footnote call out near the incorrect data and enter the required information as a comment elsewhere on the data sheet, notebook page, etc.

4.1.1.8 The cover of each notebook is identified with subject identification (instrument, method, procedure, etc). All analysts making entries in the book are required to print their names with corresponding initials and signatures in the second page of each logbook. All documentation entered must be clear, legible and detailed. Each entry must be dated by month, day and year in which the data were recorded and signed by the person performing the work or entering the data.

4.1.2 Logbook Maintenance and Archiving Procedures

4.1.2.1 Analyst Notebooks: Each analyst maintains a personal bound notebook. The analyst is able to keep notes during training sessions. Whenever the analyst's logbook becomes full, it is the analyst's responsibility to get a new replacement logbook from the QA Officer. These logbooks are subject to audits.

4.1.2.2 Instrument Maintenance Logbooks: Each instrument must have an associated logbook to record maintenance (routine and unscheduled) and repairs. These logbooks are audited for complete entries during inspections. The logbook is replaced and archived by the QA Officer. The maintenance logbooks are archived for 5 years.

4.1.2.3 Standard and Extraction Logbooks are required to keep records of standard traceability and sample preparation. These logbooks are audited for completeness, standard traceability, standard preparation, correct QC sample batching, etc. The logbooks are replaced and archived by the QA Officer. The Standard and Extraction Logbooks are archived for 5 years.

4.1.2.4 Injection run logbooks are used to record the sequence of the sample run, corresponding standards with standard codes and corresponding QC samples. The runlogs are replaced and archived by the QA Officer. The runlogs are archived for 5 years.

4.1.2.5 ATL Sample Login Logbook: The logbook is used to record the unique ATL sample identification, date sampled, turn-around-time, project, matrix type, client, client's sample identification, test, preservation, bottle type, and initials of login personnel. The logbook is audited for completeness during inspections. The logbook is archived by the QA Officer. The Sample Login logbooks are archived for 5 years.

4.1.2.6 Miscellaneous Logbooks: Refrigerator temperature log, balance check log, distilled water check, etc. are used to record various laboratory equipment. The logbooks are audited for daily monitoring and completeness. The logbooks are replaced and archived by QA Officer. The logbooks are archived for 5 years.

4.1.2.7 An Access database has been developed to record the name of the logbook, notebook code identification, department, and type of logbook, log number, date of issue and archival date.

4.2 STANDARD OPERATING PROCEDURES (SOP)

4.2.1 Development

As defined by the EPA, an SOP is a written document, which provides directions for the step-by-step execution of an operation, analysis, or action, which is commonly accepted as the method for performing certain routine or repetitive tasks.

The SOP format for analytical methods consists of Scope and Application; Summary; Interferences (for Method SOPs only); Equipment and Reagents; Sample Preparation; Procedures; Quality Control; Data Reduction and Calculations; Method Performance; Sample Preservation and Holding Times, Safety, Hazards and Waste Disposal; Pollution Prevention; Waste Management; Attachments and References.

4.2.2 Distribution

4.2.2.1 All SOPs for internal laboratory use are controlled and numbered documents. A red "controlled" stamp is placed onto each page of the document. Document name, SOP code, date issued and initials are recorded into a "Control SOP" logbook.

4.2.2.2 When revised SOPs are released into the laboratory, the "old" version is replaced with the "new" version. The "old" version is logged back into the "Controlled SOP" logbook. The document collected from the laboratory is then destroyed.

4.2.3 Archiving and Storage

4.2.3.1 All original, signed SOPs are stored in 3-ring binders according to categories: General Laboratory Practices, Volatile Organics, Semi-volatile Organics, Metals and General Chemistry.

4.2.3.2 Within the 3-ring binder, page dividers partition each SOP. Within each partitioned section, the current SOP version is in the front while the "older" versions are located in the back.

4.2.3.3 All hardcopies of the SOPs are stored in the QA Office indefinitely.

4.2.3.4 Electronic copies of the SOPs are located on the QA computer and on the server. The computer is virus checked at all times to deter virus data corruption. A second electronic copy is stored on a specified directory on the network. Only the QA Officer has access to this directory. The network is backed-up on a weekly basis followed by an incremental, daily back up.

4.3 PROJECT FOLDER

4.3.1 Organization

A project folder is generated for each batch of samples received at ATL. Sample Control initiates the collection or preparation of the documents for the project folder. The sample control documentation includes:

4.3.1.1 Chain of Custody

4.3.1.2 Project specific information regarding:

- Detection Limits
- QA/QC analyses
- Reporting requirements
- Invoicing information
- Extended storage
- Air bill
- Faxes

4.3.1.3 The SOP for Sample Login describes the process of logging samples and developing the project folder.

4.3.2 Project File Archival

Once the final report has been mailed to the client, the project folder (which contains information such as the chain-of-custody, correspondences, raw data, reports, etc.) is archived to a file room, which has limited access. The Document Control Officer is responsible for the archiving/retrieval of the project folders. The Document Control SOP describes how documents are archived and retrieved by the Document Control Officer.

All records shall be retained for 5 years from the generation of the last entry in records. For clients that require archival of records longer than 5 years, a formal request letter must be submitted prior to the start of project.

If the company closes or changes ownership, all records will be stored and /or be transferred to the new business owner(s). Also, all clients will be notified. All project folders will be available if requested. If the client does not respond, all data associated to that ATL number would be discarded after a year from the date of notification.

4.4 CONFIDENTIALITY

Original, signed reports are printed on ATL's letterhead. The original report is released to the client as specified on the Chain-of-Custody. ATL's client confidentiality policy assures that reports and associated documentation will only be released to the original client. ATL will only release data with a written authorization from the client. For requests from a regulatory agency or from a court-of-law, the laboratory is obligated to submit all information.

4.5 COMPUTER DATA SECURITY

4.5.1 All personnel are issued a unique network user name by IT upon approval from the Technical Support Manager. Each person is required to create a unique password. The passwords should be changed at least once a year.

4.5.2 All raw data is transferred to "archive" folders located in the network server. Only the primary user and the department supervisor have access to these directories.

4.5.3 All client reports are generated from ELIMS. Client Service personnel prints the final report for faxing. The department supervisors, QA officer and upper management have access to change reviewed data. All changes are accepted by password. Amended reports are re-printed and faxed to the client.

5 ANALYTICAL METHODOLOGY

5.1 ANALYTICAL PROCEDURES

Analytical procedures used for various laboratory analyses are in accordance with the EPA approved methods. Any variances in the methods have been documented for equivalency based on accuracy and precision data. All variances in the analytical methods are noted in all corresponding SOPs. These SOPs are available to the analyst under controlled copies. New methods and/or SOPs are distributed throughout the laboratory by issuing control copies. Old methods/SOPs are collected before the new documents are given to the analysts. ATL employs analytical procedures that have been certified by the State of California Environmental Laboratory Accreditation Program (ELAP). A list of methods certified by ELAP is shown in Appendix H (List of Approved Methods and Certification).

5.2 CALCULATION OF DATA QUALITY INDICATORS

All data generated at ATL are assessed for data quality in terms of accuracy, precision, completeness, representativeness, and comparability. All of these DQO are dependent on the scope of work and the level of quality control required.

Precision, accuracy, and completeness are calculated following the equations presented below. The results are reported in QC tables with the final reported results. When the project or client requests QC data, a blank, duplicate, spike, and a standard reference material are analyzed for each set of samples for precision and accuracy data. The exact quality and quantity of the QC samples are determined by the project or client.

5.2.1 Precision

A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision can be expressed in terms of the relative percent difference (RPD), relative standard deviation (RSD) and/or standard deviation. Analytical precision is measured by

$$RPD = \frac{(C_1 - C_2)}{[(C_1+C_2)/2]} \times 100$$

Replicate analyses of individual samples. If calculated from two replicates, use RPD.

Where:

RPD = the relative percent difference
C_1 = the larger of the two observed values
C_2 = the smaller of the two observed values

If calculated from three or more replicates, use RSD or coefficient of variation.

$$RSD = \frac{S}{Y} \times 100\%$$

Where:

RSD = the relative standard deviation
s = the standard deviation
$\bar{Y}$ = mean of replicate measurements

Standard deviation, s, is defined as follows:

$$S = SQRT(\Sigma \frac{(Y_1 - \bar{Y})^2}{n - 1})$$

Where:

s = standard deviation
SQRT = square root
Y_1 = measured value of replicate
$\bar{Y}$ = mean of replicate measurements
n = number of replicates

5.2.2 Accuracy:

Accuracy is measurement of the bias of a system. For measurements where matrix spikes, matrix spike duplicates and laboratory control samples are used, use percent recovery.

$$\%R = 100 \times \frac{S - U}{C_{sa}}$$

Where:

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration not spiked aliquot
C_{sa}= actual concentration of spike added

5.2.3 Completeness:

A measure of the amount of valid data obtained from a measurement system compared to the amount that expected to be obtained under normal conditions. Defined as follows for all measurements:

$$\%C = 100 \times \frac{V}{n}$$

Where:

%C = the percent completeness
V = the number of measurements judged valid
n = the total number of measurements necessary to achieve a specified statistical level of confidence in decision making.

5.2.4 Method Detection Limit (MDL)

ATL's methods for which the MDL are developed have been based on the EPA methods for 40 CFR 136 - Definition and Procedure for the Determination of the Method Detection Limit. ATL redefines the limit of detection for each parameter annually. The calculation for MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,\, 1-\alpha = 0.99)} \times S$$

Where:

MDL = the method detection limit
S = the standard deviation of the replicate analyses
$t_{(n-1,\, 1-\alpha = 0.99)}$ = the Students' t-value appropriate to a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

6 INSTRUMENT CALIBRATION AND INTERNAL QA/QC PROCEDURES

6.1 CALIBRATION

Calibration is the process for determining the correctness of the assigned values of the physical standards used or the scales of measuring the instruments.

ATL has established procedures for the calibration of each laboratory instrument and equipment. These are calibrated following the requirements of the specific methods of analysis. All calibrations and acceptance criteria are checked for conformance to these method requirements. The data resulting from the instrument calibration and the associated QC procedures used determine the frequency of the calibration process.

6.1.1 Miscellaneous equipment

6.1.1.1 Analytical and top-loading balances are calibrated using weights which are calibrated against Class "1" weights. The calibration weights bracket the weight to be measured. This calibration is recorded in the calibration notebook. The reading must be within the specified acceptance limits (See Balance SOP for details of acceptance limits). If the reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed. The balances are calibrated and serviced annually by an outside service technician.

6.1.1.2 Thermometers throughout the laboratory are calibrated annually against a NIST traceable thermometer. Each thermometer is labeled with an identifier code and the positive or negative correction factor. The positive or negative correction factor must be applied to all temperature readings from that particular thermometer. The reading must be within the specified limits for the type of thermometer. If the temperature reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed.

6.1.1.3 Pipettes are calibrated by measuring the weight of a volume of water. The calibrations of the pipettes are performed annually. The reading must be within the specified acceptance limits (See Pipette SOP for details of acceptance limits). If the reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed.

6.1.2. Classical Chemistry

6.1.1.1 UV/VIS Spectroscopy/Colorimetric

The Helios Gamma Spectrophotometer is initially calibrated by the manufacture. The spectrophotometer is then set to the method specified wavelength. The instrument is calibrated using a 3 to 5 point calibration utilizing standards from particular test methods. The coefficient of determination (r^2) of a linear regression calibration curve must be 0.995 or greater. A single mid-point standard is used for the continuing calibration verification (CCV). The CCV standard must correspond to ± 10% of the true value.

6.1.2.2 Titration

Calibrations for titration are based on the standardization against a primary standard. The concentration of an unknown solution can be determined by reacting a measured quantity of the unknown solution with a measured volume of an appropriate solution of known concentration.

6.1.2.3 Gravimetric

Gravimetric methods require that the sample be dried until the difference in consecutive weighings is less than 0.0005 grams. All weighings are based upon using a calibrated balance.

6.2 GENERAL QC INFORMATION

Method QA/QC is those measures taken to evaluate the method protocols and provide assurance that the values being obtained are correct. These are run at a frequency of one (1) per batch (batch QC sample frequencies and batch size are defined by the method series requirement and/or project requirements). A batch is defined as a group of samples, which are analyzed together with the same method sequence and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each batch must be of similar composition.

The analysis of QC samples for organics, metals, and general chemistry demonstrate that adequate recoveries have been obtained in spiked (fortified) samples, check for matrix interference in samples, confirm that reagents used for analyses have no impurities that interfere with the analysis of the analyte, identify if cross-contamination between samples has occurred during workup, check laboratory performance against reference materials, and verify the precision and accuracy of methods. The results from the QC samples such as matrix spike (MS), matrix spike duplicate (MSD), laboratory control sample (LCS), and surrogates (if applicable) are compiled and graphed on control charts. The primary functions of the control charts are to define control limits for the individual methods and as a performance monitoring tool.

The laboratory follows the minim um quality control requirements specified by each method (if and only if all parameters are the same). In general, these method specific quality control requirements will be used as a guideline to determine approximate limits until in-house limits can be generated. The laboratory will follow whichever limits are the most stringent.

If the method does not specify limits or guidelines for quality control requirements, the laboratory will default to recovery limits such as 80 – 120% and RPD of 20% (for methods such as wet chemistry) or recovery limits of 50 – 150% and RPD of 50% (for methods such as extractable organics, metals) until in-house limits can be generated.

If the method only has guidelines for the quality control requirement, then the laboratory will use them strictly as guidelines and set default limits as stated above until in-house limits can be generated.

For Field Trip and Equipment Blanks, if contaminant analyte is at or above the reporting limit and is greater than 1/10 of the amount measured in any sample, the results are considered suspect and are reported as estimated.

6.3 Instrument Calibration, Laboratory QC Procedures and Corrective Actions

Instrument calibration, QC procedures, acceptance criteria and corrective actions are described on Appendix F for organic and inorganic instrumentation analyses. In general, the following QC procedures apply:

6.3.1 Method blanks are prepared for analyses and should contain analytes less than the reporting detection limit. If the concentration of the associated blank is above the detection limit, re-analysis of the sample(s) must occur.

6.3.2 Matrix Spike (MS) / Matrix Spike Duplicate (MSD) determines accuracy and precision by calculating the amount recovered and the relative percent difference.

6.3.2.1 Acceptance criteria for recoveries of spikes used are established in-house limits.

6.3.2.2 In general, the spike concentration is spiked at or near the midpoint calibration concentration.

6.3.2.3 Spikes and duplicates results are compared with the laboratory generated control limits for acceptance criteria.

6.3.3 A Laboratory Control Sample (LCS) is prepared and analyzed for each matrix. If the LCS falls out of limits, evaluate the system and re-analyze LCS to confirm the result. If the reanalysis passes, the sample results can be reported. If the re-analysis fails, the entire batch must be re-processed (if sample amount permits). A non-conformance form must be filled out and submitted with the sample data.

7 LIMITS OF DETECTION

The Method Detection Limits (MDL) are conducted by the laboratory on an annual basis. MDLs are performed on a more frequent basis if conditions are changed from the previous MDL study. Examples of such conditions are a new instrument, new or refurbished detector or detector components, or different purge and trap device. The MDL is defined as the minimum concentration of a substance that can be measured and reported with a 99% confidence level that the analyte concentration is greater than zero. This procedure consists of analyzing seven (7) aliquots of a standard at 3 to 5 times the estimated MDL, which is taken through all the sample processing steps of the analytical method. MDLs are matrix dependent. The MDL is defined as the student T-factor times the standard deviation from the seven replicates. See Section 5.2.4 for the equation to calculate the MDL.

Once the MDL is generated, the department supervisor, the Laboratory Director, and the QA Officer reviews and approves the MDL study as being valid. The QA Officer then collects and maintains all MDL studies.

Instrument Detection Limits (IDL), for ICP metals analysis only, is determined in the same manner as the MDL with the exception that the standards are not processed through the digestion step process.

Each MDL is compared to the current reporting limits. The analyte reporting limit must be greater than or equal to the established MDL value. The spiking concentration must not exceed 10 times the MDL value. If the MDL fails to meet these criteria, the MDL needs to be re-extracted and re-analyzed.

8 . DATA COLLECTION, VALIDATION, REPORTING, AND ARCHIVING

Upon completion of all required analyses, the results are submitted for final report generation. At all stages of Data Handling (Data Collection, Validation, and Reporting), the laboratory staff and management check all data before the final deliverable package is released. The following steps detail the internal laboratory procedure that ensures the final report in a complete and concise format. The General Manager or a designated signatory person can only release the final report to the client (with their signature).

8.1 DATA COLLECTION

Computers are used to collect and quantify data from the GCMS, GC, AA, ICP and ICP-MS. For data from instruments, the data can be imported into the ELIMS for calculations and reporting. General chemistry results are manually typed into the ELIMS for reporting.

All data are spot-checked for accuracy. Concentration of the analytes found in the analysis for organics, metals, and general chemistry will be expressed according to required units depending on the sample matrix, i.e., µg/L or µg/Kg.

Data collection and review include the following:

8.1.1 Review of sample documents for completeness by the analyst(s) at each step of the analysis scheme.

8.1.2 Daily review of quality control indicators such as blanks, surrogate recoveries, duplicate analyses, matrix spikes analyses, etc. The quality control indicators must be evaluated using specific criteria described in Section 8.0. If any indicator is outside the acceptance criteria, then the analyst must follow the SOP for Non-Conformance, Corrective Actions.

8.1.3 All analyses must have data qualifiers for such items as:

- All results for EPA 8015B (modified) for fuels must be flagged if the sample pattern does not match the reference pattern.
- All results must be flagged if the method blank contains hits above the reporting limit.
- All results must be flagged for samples analyzed past holding time.

8.1.4 All manual integrations must be dated and initialed by the analyst.

8.1.5 The analyst prints a "preliminary" report from the ELIMS program. The analyst reviews of all raw data and the "preliminary" report prior to submittal for:

- Correct sample identification on raw data
- Correct analytical method
- Correct analyte list to report
- Matrix type and Units
- Dilution Factors
- Calculations and Significant Figures
- MDL, PQL
- Correct and complete QA/QC
- Complete technical check

The analyst submits a "First Level Data Review" sheet for each ATL batch number.

8.1.6 All data must be reported in a consistent unit to allow comparability of data among organization. The standard units used to report data are listed below.

8.1.7 Units of mass/volume, volume/volume, mass/mass are reported as parts per unit. The common units are:

- Parts per Million or ppm: mg/L or uL/mL or mg/Kg
- Parts per Billion or ppb: ug/L or nL/mL or µg/Kg

8.1.8 Physical parameters are reported using common units as:

- pH (pH units)
- Hardness (mg $CaCO_3$/L)
- Alkalinity (mg $CaCO_3$/L)
- Temperature (°C or °F)
- Dissolved Oxygen (mg/L)
- Flow Rate (mL/min)

8.1.9 Data is usually reported on an "as received" basis. Solid samples results are reported in wet basis but if requested can be reported in dry basis. Other reporting units are allowed, based upon client request. Refer to appropriate project descriptions for special reporting of units.

8.2 DATA VALIDATION

Once the preliminary report has been generated, the department supervisors review the report for technical errors against the raw data submitted by the analyst(s).

Results must be checked for correlation between test results from different tests. Some tests are grouped together by type (i.e. demand, general minerals, etc.). The results from each grouping should correlate through ratios, percentages, etc. If the ratios do not meet the criteria, then check for reporting and calculation errors. If all reporting and calculations are correct, then re-analyze one or more of the tests (as necessary) and re-evaluate.

The following steps are taken during the data validation process:

- All final data are visually checked for consistency and reasonableness. Series of grossly high or grossly low results are also checked. Unusually high or unexpectedly low results are verified using a different method, where possible.
- All reported data must be within the working linear range of the instrument.
- LCS and spike recovery must be within the specified control limits, or within the laboratory generated limits, when applicable. Any out-of-control data are properly qualified with an appropriate explanation (e.g., matrix interference).
- All analytical problems encountered during sample analysis must be properly addressed to provide explanations for data reviewers.
- Checks on calculations are as follows
  - Calculations from new analyst(s) are reviewed at 100%
  - A calculation from a trained analyst(s) is subject to a minimum of a 50% review.
- Supervisors must review the raw data and report for:
  - All assigned samples are properly analyzed
  - Correct matrix and units
  - Correct and complete QA/QC
  - Correct calculations (including sample preparation factor and sample dilutions)
  - Special instruction met
- The supervisor approves the "Second Level Review Section" on the bottom of the "First Level Review" sheet. If there are any problems or questions, the supervisor sends the entire data package back to the analyst for review.

8.3 FINAL REPORT & REVIEWS

8.3.1 Final Reports

After the supervisor reviews the preliminary report, the data package is submitted to the Project Coordinator(s). The Project Coordinator(s) reviews the entire package and then fill-out a "Project Coordinator" checklist which documents typographical errors, holding time issues, project specific requirements, etc. The Project Coordinator prints the final report, which includes sample results and applicable QA/QC. The Project Coordinator approves each page of the report prior to faxing. Preliminary results can be faxed to the client with a disclaimer that the results are preliminary. In order to avoid miss-communication of results, no verbal results are given to the client.(see Appendix I)

Validated results can be e-mailed or transferred to diskette at the client's request. If there are amendments to the results, a new hardcopy report must be generated. A new electronic copy can be submitted to the client.

8.3.2 Final Review

All reports are then sent to the Laboratory Director or the designated signatory person for final review. Copies of the final report are kept in the project/batch folder, and are then archived.

If the final report is found to be incomplete or additional errors are found, it is then documented and returned to the department supervisors for correction.

QA Officer reviews at least 5% of the data generated. If the final report is found to be incomplete or errors found, it is then returned to the department supervisors for correction. An amended report is generated and sends to the Laboratory Director or the designated signatory person for final review.

8.4 AMENDMENTS

Procedures for amendments and/or additions to documentation are:

- Typographical errors (client initiated) are documented by fax from the client or by documenting the conversation on the telephone log.

- Re-analysis of a test parameter may be necessary if the data is questionable to the analyst/supervisor.

- When completed, the supervisor reviews and validates all data for precision, accuracy, completeness, and comparability.

- If any result is changed, the report is amended and is faxed and mailed to the client.

- All data is archived into the project folder.

8.5 CLIENT COMPLIANTS AND QUESTIONS

When a client has a question regarding analytical data, Project Coordinator will fill out a client complaint form and direct the questions to the department supervisors. The following steps should be followed to review data:

- Review report for typographical errors
- Review results for calculation errors
- Review raw data (calibrations, method blanks, QA/QC, dilution/concentration factors, tuning, etc.)
- Inspect original sample for visual indication of result validity.
- Inspect documentation such as the COC, verify correct sample was analyzed.
- Reanalyze sample in question by original method and by a different method to confirm results (if authorized by project coordinator)
- Inform client of findings.

All finding must be documented in the Client Complaint form.

8.6 DATA ARCHIVING

All electronic data generated by instruments are backed-up at a minimum of every 4 weeks. All data is copied from the instrument computers to specific directories on the network. Only the primary user and the department supervisor have access to these directories. The network is backed-up on a weekly basis followed by an incremental, daily tape back up. These files are then copied to a recordable CD for permanent storage.

Reports generated for the client are saved directly to a specified directory on the network. Amended reports are retrieved from and saved to the network directory. The network is backed-up on a weekly basis followed by an incremental, daily tape back up. These files are then copied to a recordable CD every 6 months.

9 CORRECTIVE ACTION

The need for corrective action comes from several sources: equipment malfunction; failure of internal QA/QC checks; failure of performance of system audits; and non-compliance with QA requirements. The Non-Conformance event is documented on a Non-Conformance/Corrective Action form. The details of how the Non-Conformance/Corrective Action form is completed and routed is in the Standard Operating Procedure (SOP).

9.1 IDENTIFYING THE PROBLEM

Listed below are the steps taken to assure corrective action is implemented

9.1.1 When measurement equipment or analytical methods fail QA/QC, the problem is immediately brought to the attention of the department supervisor, the Laboratory Director and/or QA Officer. These personnel must assess whether the problem or departure has any effect on QC policy. The analyst, supervisor, QA Officer, Sample Control personnel or Project Coordinator(s) personnel, can initiate the Non-Conformance form. The previously mentioned groups can also recommend possible corrective actions to problems.

9.1.2 If QC measurements are found to be unacceptable, the analyst must follow procedures found in Section 8. Some unacceptable results may require re-analysis or re-preparation. If the re-analysis is within acceptable criteria, then the analyst does not submit a Non-Conformance form. If the re-analysis is not within acceptance criteria, then a Non-Conformance form must be submitted to document the possible matrix effects.

9.1.3 When a result in a performance audit is unacceptable, the laboratory identifies the problems and implement corrective actions immediately. Also, the unit section leader suspends the analytical work until the problem has been resolved.

9.1.4 When a system audit reveals an unacceptable performance, work is suspended until corrective action has been implemented and performance has been proven to be acceptable.

9.1.5 If failure is due to equipment malfunction, the equipment is repaired, precision and accuracy are reassessed, and the analysis is re-run. All attempts are made to reanalyze all affected parts of the analysis so that in the end, the product is not affected by failure of QA requirements.

9.1.6 All incidents of QA failure and the corrective action tasks are documented and reports are placed in the appropriate project file.

9.2 DOCUMENTING THE NON-CONFORMANCE

Once the non-conformance has been identified, a non-conformance form must be filled out and submitted to the QA Officer. The non-conformance form is a 2 page carbon-less form in which the copy is placed into the project folder and the original is submitted to the QA Officer.

The non-conformance forms contain incident description, samples affected, possible cause, corrective action, and proof of conformance.

9.3 NON-CONFORMANCE TRACKING

Once the Non-Conformance is submitted to the QA Officer, it is recorded into an Access database. This database is able to track Non-Conformances by department, analyst, test methods, matrix type, etc.

9.4 REPORTS

Non-Conformance reports for all departments are given to the Laboratory Director. Each department supervisor is also given a Non-Conformance report for his or her respective departments. The report is generated by the type of non-conformance (internal standard failed, refrigerator temperature out of limits, etc.) and by those non-conformances that are still outstanding.

The general manager/ laboratory director will decide the release of the reports having non-conformances items. Decision making for releasing the report are based on the following: (1) Technical Level –bench level operation, (2) Legal level –QA/QC conformance and regulatory, (3) Business –based on client data usage.

9.5 CLOSURE

Those non-conformances that are outstanding must be closed by the time the next report is issued to management. If these non-conformances are not closed, the QA Officer must investigate the problem and close the non-conformance.

10 HOLDING TIMES AND PRESERVATION

The laboratory conforms to all regulations for holding times and preservations. See Appendix G for tables of holding times and preservations (Referenced from EPA SW-846).

11 VERIFICATION PRACTICES

11.1 INTERLABORATORY COMPARISONS

For interlaboratory performance evaluation samples, ATL utilizes the data to evaluate the analyst compared to other analysts in the area. The results of the interlaboratory comparison are recorded onto the analyst-training file. If there are "unacceptable" results, the analyst must submit a Non-Conformance Form.

11.2 PROFICIENCY TESTING PROGRAMS

ATL participates in performance evaluation sample analyses as a requirement of NELAC (National Level) and ELAP (State Level). The laboratory must perform proficiency samples for wastewater, drinking water and hazardous waste. If there is "unacceptable" result, the analyst must submit a Non-Conformance form. A corrective action letter is submitted to the State Agency for all analytes that did not pass acceptance criteria. Another proficiency sample must be submitted for evaluation.

11.3 REFERENCE MATERIALS

Reference materials can be used in the laboratory to verify results against a certified value. These reference materials are purchased from NIST certified vendors. ATL utilizes certified reference materials to validate methods, verify instrument performance, preparation procedures, standard preparation and calibrations.

11.4 INTERNAL QUALITY CONTROLS

The QA Officer conducts internal "blind" performance evaluation samples as part of the training program. These "blind" performance evaluation samples are submitted to the analyst after the initial training has been completed and every 12 months after proficiency has been established. All results from the internal performance evaluation samples are evaluated for accuracy. The results are graded on a "PASS/FAIL" system. All analytes that "fail" must have a corrective action and a subsequent sample will be re-submitted.

12 LABORATORY AUDITS AND APPROVALS FROM OTHER AGENCIES

12.1 AGENCY AUDITS

ATL retains the laboratory approval from National Environmental Laboratory Accreditation Program (NELAP) through the California Department of Health Services and the Environmental Laboratory Accreditation Program (ELAP). (See Appendix H for ATL's Certification). NELAP/ELAP perform inspections of the laboratory every 2 years. Any recorded deficiencies are corrected and a response letter is submitted to ELAP.

12.2 CLIENT AUDITS

Clients can audit or inspect the laboratory for conformance to EPA methods and/or specific project requirements. After the audit, a formal letter describing any findings is submitted to the laboratory. All findings will require corrective actions and evidence or proof of conformance for the response letter.

12.3 INTERNAL LABORATORY AUDITS

Internal audits are performed on a quarterly basis but may be performed more frequently if the QA Officer determines a need for more frequent audits. An internal audit encompasses Sample Control, Organics, and Inorganics. Items checked for include, but are not limited to the following:

- Runlog are checked for completeness, verification of calculations, and for standard traceability.
- Balances, oven temperatures, refrigerator temperatures are being recorded.
- Standard logbooks are checked for completeness and for traceability.

The internal audits are documented on checklists during the actual audit. A form report is generated based on the findings, and is then distributed to the General Manager, Laboratory Director, and the department supervisors.

All deficiencies found during an internal audit are written into a report. The report is then given to the General Manager, Laboratory Director, and the department supervisor. All corrections must be completed within 10 working days. A follow-up inspection is performed on the outstanding findings. Findings not completed are documented in the monthly report to the Laboratory Director and/or General Manager .

If deficiencies during the internal audit compromise the quality of data, an immediate corrective action is implemented by the QA Officer, department supervisor, Laboratory Director and/or the General Manager (if necessary).

13 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Data from formal performance audits of the laboratory's activities are reviewed directly by the QA Officer, General Manager, Laboratory Director, and the department supervisors.

All quality assurance or quality control issues are discussed among the QA Officer, General Manager, Laboratory Director, and the department supervisors. The report can be used as a focal point for discussion involving corrective action. Any corrective action taken is decided with the concurrence of the unit department supervisors, the QA Officer, and/or Project Coordinator, and the Laboratory Director.

The QA Officer provides a QA/QC management report on a monthly basis to the General Manager. The report describes any significant quality assurance problem and/or solution, results of performance and system audits, assessment of accuracy and precision data, and health and safety issues. At the end of the calendar year, an overall QA/QC report will be compiled that will outline problems (short-term and long-term), solutions, areas to improve, and long-term goals for the upcoming year. The supervisors, Laboratory Director, and General Manager can also make comments and/or suggestions to the report.

14 REFERENCES

14.1 Federal Register, 40CFR Part 136, October 26, 1984, "Guidelines Establishing Test Procedures for Analysis of Pollutants the Clean Water Act.

14.2 Taylor, John K., Quality Assurance of Chemical Measurements, Lewis Publishing, 1987.

14.3 USEPA, Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600/4-79-019, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.

14.4 USEPA, Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.

14.5 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1987.

14.6 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1992.

14.7 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1996.

14.8 USEPA, Testing Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA-600/4-82-057, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1982.

Appendices

Appendix A

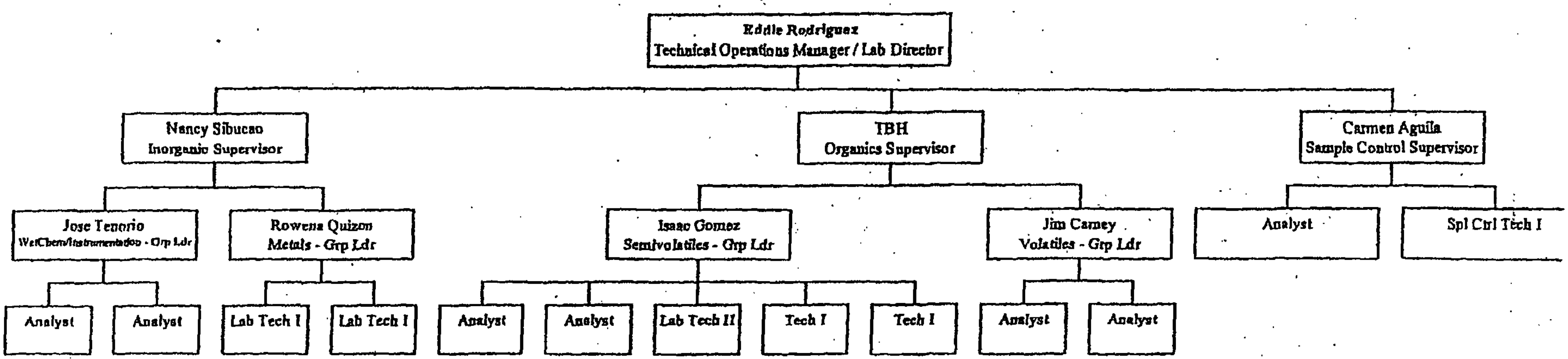
ATL Organizational Chart

Advanced Technology Laboratories, Inc.

Ed Caballero
General Manager

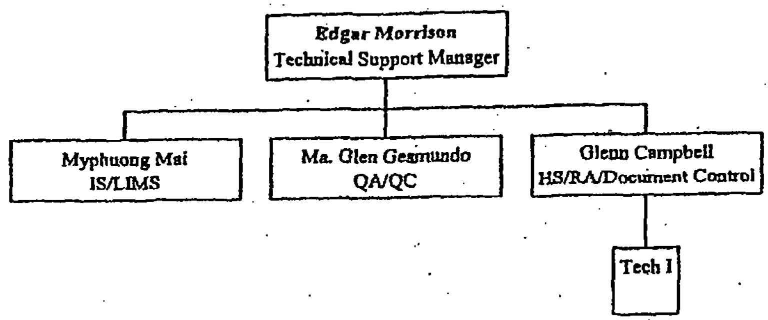
Puri Romualdo	**Eddie Rodriguez**	**Edgar Morrison**	**Ed Romualdo**
Sales/Marketing Manager	Tech. Operations Mgr / Lab Director	Tech. Support Manager	Finance/Accounting Manager

Operations



Eddie Rodriguez
Technical Operations Manager / Lab Director
Nancy Sibucao
Inorganic Supervisor
TBH
Organics Supervisor
Carmen Aguila
Sample Control Supervisor
Jose Tenorio
WetChem/Instrumentation - Grp Ldr
Rowena Quizon
Metals - Grp Ldr
Isaac Gomez
Semivolatiles - Grp Ldr
Jim Carney
Volatiles - Grp Ldr
Analyst
Spl Ctrl Tech I
Analyst
Analyst
Lab Tech I
Lab Tech I
Analyst
Analyst
Lab Tech II
Tech I
Tech I
Analyst
Analyst

Support


Edgar Morrison
Technical Support Manager
Myphuong Mai
IS/LIMS
Ma. Glen Geamundo
QA/QC
Glenn Campbell
HS/RA/Document Control
Tech I

Appendix B

List of Key Personnel and Responsibilities

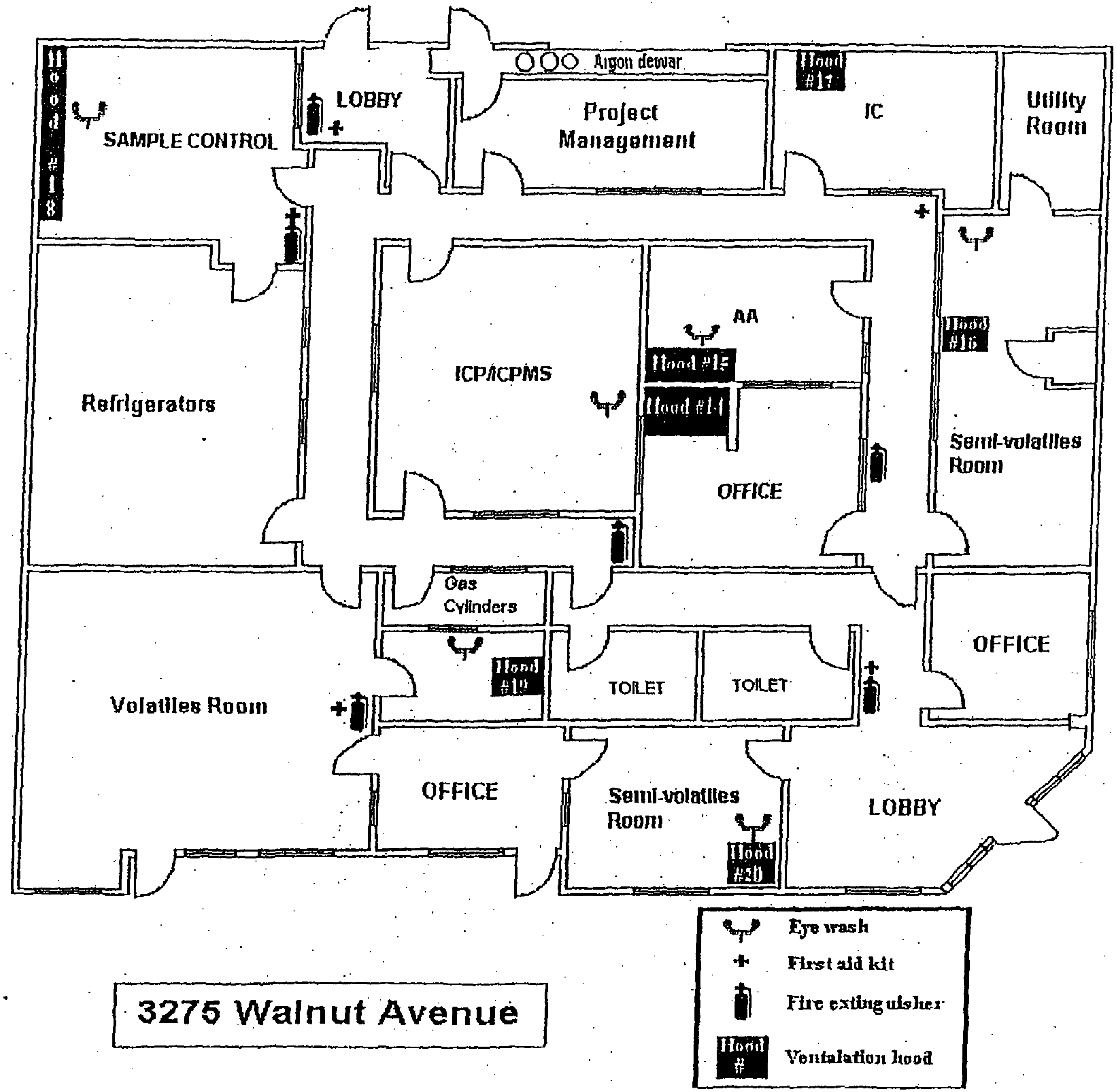
Advanced Technology Laboratories
Key Personnel

Name	Title	Responsibilities	Years of Experience	Education
Edgar Caballero	General Manager	• Supervising and administrating the quality assurance program. • Ensuring that all general and client-specific quality assurance requirements are strictly followed. • Resolving the approval/rejection of deliverable client sample data package and/or reports.	**32 Years**; 11 years as Chemist, 9 years as President of CRL, 4 years as President of ET&T, 8 years as General Manager of ATL	B.S., Chemistry
Puri Romualdo	Administration Director/ Project Manager	• Defining and meeting the project requirements including the contractual requirements of the NFESC program. • Implementing the appropriate quality procedures for project activities in support of the QAPP. • Communicating with the Technical Operation Manager and/or QAO relating to QA/QC activities.	**32 Years**; 11 years as Chemist, 10 years as Vice-President of CRL; 4 years of Vice-President of ET&T; 8 years as Vice-President of ATL	B.S., Chemical Engineering

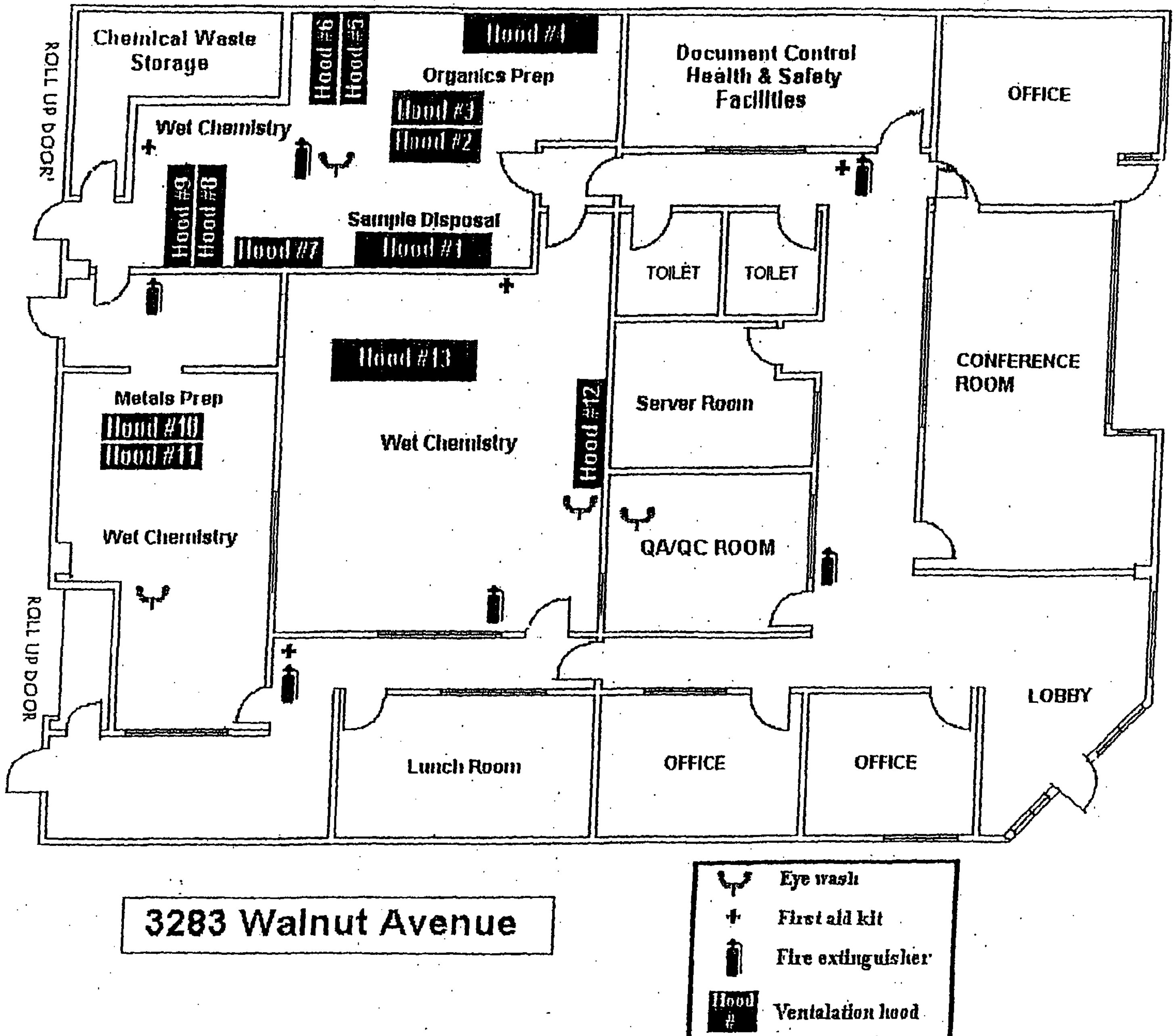
Name	Title	Responsibilities	Years of Experience	Education
Eddie Rodriguez	Laboratory Director/Technical Operations Manager	· Ensuring that sufficient numbers of qualified personnel are employed to supervise and perfom the work of the laboratory. · Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.	**12 years;** 2 year as Laboratory Director.7.5 years as department supervisor, 3.5 years as staff chemist.	B.S., Chemical Engineering
TBH	Organic Supervisor	· Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions. · Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff. · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.		
Nancy Sibucao	Inorganic Supervisor	· Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions. · Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff. · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.	**6 Years;** 4 years as Chemist, 2 year supervisor	B.S Chemical Engineering

Name	Title	Responsibilities	Years of Experience	Education
Glen Gesmundo	QA/QC Officer	· Responsible for implementation and monitoring of the laboratory quality assurance program · Ensuring that all data generated is scientifically sound, legally defensible, and of known precision and accuracy. · Monitoring the QA plan on a periodic basis to ensure compliance with the QA objectives of the laboratory. · Developing and implementing new QA procedures within ATL to improve data quality. · Conducting audits and inspections of all division sections on a periodic basis. · Coordinating the analysis of performance evaluation (PE) samples for all analytical divisions on a periodic basis. · Evaluating the results; reporting the results to the General Manager and appropriate Group Leaders; and applying corrective action as needed. · Establishing and maintaining statistical and data records that accurately reflect the quality assurance performance of all analytical divisions. · Maintaining and overseeing the master sources of all SOPs, training logs and completed/full laboratory notebooks. · Serving as the in-house client representative on all projects inquires involving data quality issues.	**3 Years;** 3 years Organic Chemist; 3 months QA Officer	M.S., Agricultural Chemistry minor in Environmental Science BS Chemical Engineering

Appendix C
Laboratory Lay-Out



3275 Walnut Avenue



3283 Walnut Avenue

Appendix D
List of Instrumentation and Equipment

EQUIPMENT LIST

(updated 03/10/04)

Volatile Organics - EPA Method 8240/8260/624			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	5890 Series II
2	Gas Chromatograph	Hewlett Packard	6890
1	GC Mass Spectrometer	Hewlett Packard	5971A MSD Quadrapole
1	GC Mass Spectrometer	Hewlett Packard	5972 MSD Quadrapole
2	GC Mass Spectrometer	Hewlett Packard	5973 MSD Quadrapole
2	Purge & Trap Concentrator	Tekmar	LSC 3100
2	Purge & Trap Concentrator	Tekmar	LSC 3000
1	Purge & Trap Concentrator	Tekmar	Velocity XPT
3	Auto Sampler	Tekmar	Precept II
1	Auto Sampler	Tekmar	Solatek 72
1	Auto Sampler	Archon	5100
4	Data System	Hewlett Packard	Enviroquant
1	Analytical Balance	Mettler	BD202
4	Computers	Dell	Optiplex GXI
2	Printers	Hewlett Packard	Laser Jet 4
Volatile Organics - EPA Method 8015/8021/602 [illegible]			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	5890 Series II w/FID/PID
1	Gas Chromatograph	Hewlett Packard	5890 w/FID/PID
2	Purge & Trap Concentrator	Tekmar	LSC 3100
1	Purge & Trap Concentrator	Tekmar	LSC 3000
2	Auto Sampler	Tekmar	Precept II
1	Auto Sampler	Archon	5100
3	Data System	Hewlett Packard	Enviroquant
3	Computer	Dell	Optiplex GXI
2	Printer	Hewlett Packard	Laser Jet 4, 6P

Semi-Volatile Organics - EPA Method 8270/625			
Qty	Equipment	Make	Model
2	Gas Chromatograph	Hewlett Packard	6890
2	GC Mass Spectrometer	Hewlett Packard	5973 MSD Quadropole
1	Liquid Auto Sampler	Hewlett Packard	7683
1	Liquid Auto Sampler	Hewlett Packard	6890 series
2	Data System	Hewlett Packard	Enviroquant
1	Hood	Presscott	Custom
1	Refrigerator	VWR	Explosion Proof for Standards
2	Computer	Dell	Opteplex GX1
1	Printer	Hewlett Packard	Laser Jet 5

Semi-Volatile Organics - EPA Method 8015/8081/8082			
Qty	Equipment	Make	Model
2	Gas Chromatograph	Hewlett Packard	5890 Series II w/dual ECD
2	Gas Chromatograph	Hewlett Packard	6890 Series w/ dual ECD
2	Gas Chromatograph	Hewlett Packard	5890
1	Gas Chromatograph	Hewlett Packard	5890 Series II w/2 FID
4	Liquid Auto Sampler	Hewlett Packard	7673
2	Liquid Auto Sampler	Hewlett Packard	6890
2	Liquid Auto Sampler	Hewlett Packard	7683
6	Data System	Hewlett Packard	Enviroquant
5	Computer	Dell	Optiplex GXI
1	Computer	Dell	Optiplex GX100
1	Printer	Hewlett Packard	Laser Jet 4
1	Printer	Hewlett Packard	Laser Jet 4000
1	Printer	Hewlett Packard	Laser Jet 1100
1	Hood	Custom Made	
3	Refrigerators	Various	

[illegible]			
Qty	**Equipment**	**Make**	**Model**
1	Inductively Coupled Plasma	Thermo Jarrell Ash	ICAP 61E Trace Simultaneous
1	Inductively Coupled Plasma	Perkin Elmer	Optima 4300DV
1	Inductively Coupled Plasma_Mass Spectrophotometer	Perkin Elmer	ELAN 6100
2	Auto Sampler	Perkin Elmer	AS 91, AS93 plus
1	TJA Auto Sampler	Thermo Jarrell Ash	TJA
1	Chiller	Polyscience	
1	Chiller	Neslab	
1	Analytical Balance	Sartorius	BA100S
3	Computer	Dell	Optiplex Gx1, GX150,Gn+
2	Printer	Hewlett Packard	Laser 4000/Laser 4100

[illegible]			
Qty	**Equipment**	**Make**	**Model**
1	Atomic Absorption Spectrometer	Perkin Elmer	AAnalyst 300
2	Autosampler	Perkin Elmer	AS-90
1	Graphite Furnace	Perkin Elmer	AAnalyst 600
1	Mercury Cold Vapor Analyzer	Perkin Elmer	FIAS 400
22	AA Lamps	PE	Various Elements
1	Auto Diluter	Perkin Elmer	Autoprep-50
1	Centrifuge	Centrifuge International	Model HN
1	Hood	Prescott	Custom
3	Data System	Perkin Elmer	AAnalyst
3	Computer	Dell	Gxa,GX1,Gnt
1	Printer	Hewlett Packard	LaserJet 4 L

Inorganics - EPA Method 300 Series TOX/TOC			
Qty	**Equipment**	**Make**	**Model**
1	TOC Analyzer wit Boat Sampler	Dorhman	DC-190 for water & soil
1	TOX Analyzer	Dorhman	DX-2000 for water & soil
1	Ion Chromatograph	Dionex	ICS-2000
1	Ion Chromatograph	Dionex	DX-4500 series
1	Ion Chromatograph	Dionex	DX-100
2	Data System	Dorhman	Integrated w/instrument
2	Data System	Dionex	Integrated w/instrument
3	Auto Sampler	Dionex	AS40
1	Computer	NEC	Optiplex 433s/Mx/Infinia
1	Computer	Dell	Optiplec GXi
1	Computer	Toshiba	Pentium
1	Refrigerator		
2	Printer	Epson	LQ570
1	Printer	Hewlett Packard	Laser JetIIISi
1	Conductivity meter	Orion	115

Classical Wet Chemistry			
Qty	**Equipment**	**Make**	**Model**
1	Analytical Balance	Sartorius	SP 180
1	COD Block Heater	Hach	—
1	Convection Oven	Scientific Products	DK-3
1	Cyanide Distillation Set-up	Andrews	MIDI-Cyanide
1	Flash Point Apparatus	Precision Scientific	Pensky Marten Closed Cup
4	Hot Plate/Stirrer	Corning/Thermolyne	PC-101
1	Muffle Furnace	Thermolyne	Furnace 1400
1	Oil and Grease Extraction Set-up	Horizon/JT Baker	SPE-DEX 3000XL/Speed Disk
1	pH Meter	Orion	720A
1	DO Meter	Orion	720A
1	Phenol Distillation Set-up	Witeg	Custom
3	Specific Ion Electrodes	Orion	Miscellaneous
1	Turbidimeter	Le Motte	2008
1	UV/VIS Spectrophotometer	Thermo	Helios Gamma
1	Nano Pure System	Barnstead	
3	Computer	Dell	Optiplex GX1,GX110,GX100
1	Printer	Hewlett Packard	Laser 4050N
1	Incubator	Precision Scientific	Low Temp. Incubator 815
1	Hood	Prescott	Custom

Sample Preparation Chemistry			
Qty	**Equipment**	**Make**	**Model**
4	Hot Block Digester	AJ Scientific/Env.Express	——
2	Acid Proof Cabinets	——	——
2	Fire Proof Cabinets	——	——
8	Hot Plate	Corning/Linberg/Thermolyne	Various
1	Shaker	Labline	Orbit Shaker
1	Labeler	Zebra	Z4000
2	Computer	Dell	Optiplex GX100, GXi
3	Fume Hood	Labconco	
8	Fume Hood	Prescott	Custom
2	Sonicator	Tekmar	Various
1	STLC Extractor	Env. Express	——
6	TCLP ZHE Extractor	Millipore	——
2	TCLP Bottle Extractor	Millipore	——
1	TCLP Rotator	Environmental Express	——
3	Top Loading Balance	Mettler	DB202
5	TurboVap Concentrator	Zymark	TurboVap 500
1	Refrigerator		

Health and Safety			
Qty	**Equipment**	**Make**	**Model**
9	First Aid Kits	Lab Safety Products	Various
12	Fire Extinguishers	Underwriter Laboratories	First Alert
14	Half Face Masks	3M	With Organic Vapor Cartridges
5	Portable Eye Wash/Plumbed	Fend-all Company	EyeSaline
1	Safety Shower	Lab Safety Supply	——
1	SCBA-5 minute	North	
2	SCBA-30 minute	North	800 Series
2	SCBA-15 minute	Scott	——
1	Spill Containment Set-up	Labconco	——
1	Spill Kit	Labconco	——

Sample Control			
Qty	**Equipment**	**Make**	**Model**
1	pH Meter	VWR Scientific	2000
1	Conductivity meter	Orion	115
1	Turbidimeter	Le Mott	208
1	Top Loading Balance	Sartorius	B3103
20	Sample Coolers	Miscellaneous	Various sizes
1	Walk-in Refrigerator	Norlake	4°C coolers for Volatile
2	Walk-in Refrigerator	Norlake	4°C coolers for Volatile/Soil
2	Computer	Dell	Optiplex GX1
1	Computer	Dell	Optiplex SX 270
1	Printer/Copier/Fax	Hewlett Packard	Laser Jet 3150
1	Printer	Hewlett Packard	Laser Jet 5P
1	Fume Hood	Presscott	Custom

Field Compliance Services			
2	Bailers/Sampling Thief		
1	Field Truck	Chevy	S-10
1	H_2S monitor		
1	pH meter	VWR	2000/3000 series
1	Steam Cleaning Equipment	Hotsy	
1	Utility Vehicle	GMC	Safari
1	Utility Vehicle	Chevrolet	Blazer
2	24-hr Composite Sampler	ISCO	2910

Document Control/Client Services			
Qty	**Equipment**	**Make**	**Model**
2	Computer	Dell	GX260,GX240
2	Computer	Dell	GX1, Precision 450
2	Printer	Hewlett Packard	Laser Jet 4000, Deskjet 820CSE
2	Copier	Hewlett Packard	990CX1
2	Printer/Fax Machine	Minolta	Di520/EP8600
1	Scanner	Ricoh	IS4500E
1	e-Cabinet	Ricoh	45332
Laboratory Information Management System (LIMS)			
1	Server 1	Dell	LIMS Server
1	Server 2	Dell	Data File
1	Server 3	Dell	LIMS backup server
1	Server 4	Dell	Email
2	Barcode Printer	Zebra	Z4000
2	Barcode Scanner	Metrologic	MS 6720

Appendix E
ATL Chain-of-Custody Form

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90807
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#: ______________________

Logged By: ______________ Date: __________

Method of Transport
- Client ☐
- ATL ☐
- CA OverN ☐
- FEDEX ☐
- Other: __________

Sample Condition Upon Receipt

1. CHILLED	Y☐ N☐	4. SEALED	Y☐ N☐
2. HEADSPACE (VOA)	Y☐ N☐	5. # OF SPLS MATCH COC	Y☐ N☐
3. CONTAINER INTACT	Y☐ N☐	6. PRESERVED	Y☐ N☐

Client: | Address: | TEL: ( )

Attn: | City | State | Zip Code | FAX: ( )

Project Name: | Project #: | Sampler: (Printed Name) (Signature)

Relinquished by: (Signature and Printed Name)	Date :	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date :	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date :	Time:	Received by: (Signature and Printed Name)	Date:	Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter:

______________ Print Name ______ Date

______________ Signature

Send Report To:
Attn: ______________
Co: ______________
Address ______________
City ________ State ____ Zip ____

Bill To:
Attn: ______________
Co: ______________
Address ______________
City ________ State ____ Zip ____

Special Instructions/Comments:

Sample Disposal
Unless otherwise requested, all samples will be disposed 45 days after receipt.

Records Archive / Disposal:
- ☐ Laboratory Standard (1 year)
- ☐ Other ______________
- ☐ Return To: ______________

Storage: • Sample : $2.00 / sample / month (after 45 days)
• Records : $1.00 / ATL workorder / month (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFIED APPROPRIATE MATRIX

Q A / Q C
- RTNE ☐
- CT ☐
- SWRCB ☐
- Logcode ______
- OTHER ______

ITEM	LAB USE ONLY: Batch #: Lab No.	Sample I.D. / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (SNA)	6010B (Total Metal)	8015B (GRO) / BTEX	8015B (DRO)								SOIL	OIL	GROUND WATER	AIR			TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS

• T[illegible] starts 8 a.m. following day if [illegible]s received after 3 p.m.

TAT: A= Overnight ≤ 24 hr | B= Emergency Next workday | C= Critical 2 Workdays | D= Urgent 3 Workdays | E= Routine 7 Workdays

Preservatives: H=Hcl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

Container Types: T=Tube V=VOA L=Liter P[illegible] J=Jar B=Tedlar G=Glass P=Plastic M=Metal

DISTRIBUTION: White with [illegible] Yellow to folder, Pink to submitter.

Appendix F:

Tables of Instrument Calibration, Laboratory QC Procedures and Corrective Actions

Appendix F. Summary of Instrument Calibration, Laboratory QC Procedures and Corrective Actions.

Method EPA 8260B/EPA 624 (Volatile Organics by GC-MS)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	As listed in SW8260B	Evaluate system. Retune instrument.
Five point calibration	Initial calibration prior to sample analysis	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤30.	Evaluate System. Repeat initial calibration.
		For Target Analytes: 1. **Ave of RF:** mean %RSD for all analytes ≤ 15% 2. **Linear Regression:** r^2=0.99	If mean %RSD exceeds 15%, choose linear regression.
Second Source calibration verification	With each initial calibration	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤20%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and every 12 hours for Method 8260B and 24 hours for Method 624.	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤20%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Internal Standards	Each calibration standard and sample	IS area for sample must be within –50% to + 200% of last calibration verification standard. IS RT for sample must be ± 30 seconds of the IS RT in calibration verification standard.	a.Check calculations, standard preparation, instrument malfunction and sample interferences. Rerun the sample. b. Recalibrate the instrument.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, recalibrate and reanalyze the entire batch.

Method EPA 8260B/EPA 624 (Volatile Organics by GC-MS) continued			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Retention time(RT) evaluation	Each sample	Relative retention time (RRT) within ± 0.06 units of RRT in continuing calibration standard.	Correct problem. Check for interferences. Reanalyze all affected samples.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Method EPA 8270C/625 (Semivolatile Organics by GC-MS			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Check of mass spectral ion intensities using DFTPP.	Prior to initial calibration and calibration verification	As listed in SW8270C	Evaluate system. Retune Instrument.
Five point calibration	Initial calibration prior to sample analysis	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤30%.	Evaluate System. Repeat initial calibration.
		For Target Analytes: 1. **Ave of RF**: mean %RSD for all analytes ≤ 15%. For Method 625, all target analytes %RSD ≤ 35. 2. **Linear Regression:** r^2=0.99	If mean %RSD exceeds 15% for Method 8270C and 35% for Method 625,choose linear regression.
Second Source calibration verification	With each initial calibration	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤20%	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and every 12 hours for Method 8270C and 24 hours for Method 625.	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤30. For Method 625, all analytes must be ≤20%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Internal Standards	Each calibration standard and sample	IS area for sample must be within –50% to + 200% of last calibration verification standard. IS RT for sample must be ± 30 seconds of the IS RT in calibration verification standard.	a.Check calculations, standard preparation, instrument malfunction and sample interferences. Rerun the sample. b. Recalibrate the instrument.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.

Method EPA 8270C/625 (Semivolatile Organics by GC-MS continued			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Retention time(RT) evaluation	Each sample	Relative retention time (RRT) within ± 0.06 units of RRT in continuing calibration standard.	Correct problem. Check for interferences. Reanalyze all affected samples.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Methods EPA 8015B (Total Volatile Petroleum Hydrocarbons by GC/FID [Gas])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD ≤ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, re-prepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteriabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8015B (Total Extractable Petroleum Hydrocarbons by GC/FID[Diesel])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD $\leq$ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, re-prepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criterlabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8021B ([BTEX + MTBE] Aromatic Halogenated Volatiles			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD ≤ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteriabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8081A (Organochlorine Pesticides)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Pesticide Evaluation Mix (Breakdown check using DDT and Endrin)	Prior to initial calibration and continuing calibration verification	Calculated % breakdown must be ≤ 15% for both Endrin and DDT.	Evaluate system. Perform maintenance. Re-analyze PEM.
Five point calibration	Initial calibration prior to sample analysis	1. **Ave RF:** % RSD ≤ 20 2. **Linear regression:** $r^2 > 0.99$ 3. **RSD Averaging:** Ave % RSD for all analytes including surrogates must be ≤ 20%.	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, rep-repare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8082 (Polychlorinated Biphenyls [PCBs])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	1. **Ave RF:** % RSD ≤ 20 2. **Linear regression:** $r^2 > 0.99$ 3. **RSD Averaging:** Ave % RSD for all analytes including surrogates must be ≤ 20%.	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC critera batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Method EPA 6010B (Metals by ICP) and 200.8(Metals by ICPMS).			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration	Initial calibration prior to sample analysis	r>0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)/ Continuing Calibration Blank (CCB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Interference Check Standard AB (ICSAB) (For ICP only)	At the beginning of analytical sequence.	Within 20% of expected value.	a.Investigate source of interference. Correct instrument if necessary and rerun ICSAB. b. Adjust interelement correction factors. Recalibrate the instrument.
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Internal Standard (200.8 only)	Added to every sample including standards and blanks prior to analysis.	60-125% of ICB's IS intensity	a.Check for instrument malfunction. Check for sample interference. Rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be <PQL.	Check instrument. Re-do MDL.

EPA 7000 series(Metals by AA)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration (minimum of 3 standards and a calibration blank)	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)/ Continuing Calibration Blank (CCB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 300.0 (Inorganic Anions by IC)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration (minimum of 3 standards and a calibration blank)	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < RL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < RL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	80-120%	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	Twice a year per instrument.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Spectrophotometer Tests

Calibration QC Check	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Continuing Calibration	Every 20 samples	± 10%	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	One for each test per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Titration Tests

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Titrant standardization	Every 20 samples	Within 5% of expected concentration	Check calculations and standard preparation. Reanalyze.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.

pH			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Three Buffers	Beginning of use / new chemist	Within 0.1 unit of true value	Recalibrate instrument.
Buffer Check	Every 10 samples and at the end of the sample batch.	Within 0.1 unit of true value	Recalibrate instrument.
Duplicate	Every 10 samples	% RPD must be < current control limits	Reanalyze original sample and sample duplicate.
Gravimetric Tests			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Balance Check	Beginning of use.	Within current control limits.	Recalibrate instrument.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Sample Duplicate	Every 20 samples	RPD: 20%	Reanalyze original sample and sample duplicate.

Distillation Tests +Spectrophotometer Tests			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration	Initial calibration prior to sample analysis	$r > 0.995$	Evaluate system. Repeat calibration.
Continuing Calibration	Every 20 samples	± 10%	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix Spike / Matrix Spike Duplicate (MS/MSD)	Every 20 samples	80 – 120% (70-120%: sulfide)	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS
MDL study	One for each test per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Appendix G
Tables of Holding Times & Preservation

Holding Times and Preservation

Name	Container	Preservation	Maximum Holding Times
Inorganic Tests:			
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand	P, G	Cool, 4°C	48 hours
Bromide	P, G	None Required	28 days
Biochemical Oxygen Demand	P, G	Cool, 4°C	48 hours
Chemical Oxygen Demand	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	P, G	None Required	28 days
Chlorine, total residual	P, G	None Required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, total and amenable	P, G	Cool, 4°C, NaOH to pH>12, 0.6 g ascorbic acid	14 days
Fluoride	P, G	None Required	28 days
Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
pH	P, G	None Required	Analyze immediately
Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Metals:			
Chromium VI	P, G	Cool, 4°C	24 hours
Mercury	P, G	HNO_3 to pH<2	28 days
Metals, except Chromium VI and Mercury	P, G	HNO_3 to pH<2	6 months
Nitrate	P, G	Cool, 4°C	48 hours
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	P, G	Cool, 4°C	48 hours
Oil and Grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic carbon	P, G	Cool, 4°C, Hcl or H_2SO_4 to pH<2	28 days
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours
Dissolved Oxygen	G	None Required	Analyze immediately
Phenols	G only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, total	P, G	Cool, 4°C	7 days
Residue, filterable	P, G	Cool, 4°C	7 days
Residue, nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, Settleable	P, G	Cool, 4°C	48 hours
Residue, Volatile	P, G	Cool, 4°C	7days
Silica	P	Cool, 4°C	28 days
Specific Conductance	P, G	Cool, 4°C	28 days
Sulfate	P, G	Cool, 4°C	28 days
Sulfide	P, G	Cool, 4°C, add zinc acetate plus sodium hydroxide to pH>9	7 days
Sulfite	P, G	None Required	Analyze immediately
Surfactants	P, G	Cool, 4°C	48 hours
Temperature	P, G	None Required	Analyze immediately
Turbidity	P, G	Cool, 4°C	48 hours
Organic Tests:			
Purgeable Halocarbons	G, Teflon-lined septum	Cool, 4°C	14 days
Purgeable Aromatic Hydrocarbons	G, Teflon-lined septum	Cool, 4°C,	14 days
Volatile Organics	G, Teflon-lined septum	Cool ,4°C, HCL to pH<2	14 days
Pesticides and PCB	G (amber), Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction
Polynuclear Aromatic Hydrocarbons	G, Teflon-lined cap	Cool, 4°C, store in the dark	7 days until extraction 40 days after extraction
Base/Neutrals, Acids	G (amber), Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction

Appendix H

ATL's Laboratory Certifications

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

ADVANCED TECHNOLOGY LABORATORIES

3275 WALNUT AVENUE

SIGNAL HILL, CA 90755

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No:	02107CA
Expiration Date:	05/31/2005
Effective Date:	05/31/2004

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam
George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

State of California—Health and Human Services Agency

Department of Health Services

SANDRA SHEWRY
Director

ARNOLD SCHWARZENEGGER
Governor

May 27, 2004

Certificate No.: 02107CA

EDUARDO RODRIGUEZ
ADVANCED TECHNOLOGY LABORATORIES
3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Dear EDUARDO RODRIGUEZ:

This is to advise you that the laboratory named above has been granted interim accreditation under National Environmental Laboratory Accreditation Program (NELAP) as an environmental testing laboratory pursuant to the provisions of the California Environmental Laboratory Improvement Act (Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.).

The Fields of Accreditation for which this laboratory has been accredited under this Act are enclosed. Accreditation shall remain in effect until **May 31, 2005** or until full accreditation is granted, unless revoked or withdrawn at your written request. To obtain full accreditation and to ensure continuous accreditation, the laboratory shall comply with the National Environmental Laboratory Accreditation Conference (NELAC) Standards and all associated California Environmental Laboratory Accreditation Program (ELAP) regulations and statutes.

Please note that your laboratory is required to notify California ELAP of any major changes in key accreditation criteria within 30 calendar days of the change. This written notification includes but is not limited to changes in ownership, location, key personnel, and major instrumentation (Section 100845(b) and (d), HSC, and NELAC Standard Section 4.3.2). The certificate must be returned to California ELAP upon loss of accreditation.

Your continued cooperation is essential to maintain high quality of the data produced by environmental laboratories accredited by the State of California.

If you have any questions, please contact Rosalinda Lomboy at (213) 580-5731.

Sincerely,

George C. Kulasingam

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

Enclosure

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED
FIELDS OF ACCREDITATION

ADVANCED TECHNOLOGY LABORATORIES — Lab Phone (562) 989-4045

3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Certificate No: 02107CA Renew Date: 05/31/2005 INTERIM

103 - Toxic Chemical Elements of Drinking Water			
103.140	002	EPA 200.8	Antimony
103.140	003	EPA 200.8	Arsenic
103.140	004	EPA 200.8	Barium
103.140	005	EPA 200.8	Beryllium
103.140	006	EPA 200.8	Cadmium
103.140	007	EPA 200.8	Chromium
103.140	008	EPA 200.8	Copper
103.140	009	EPA 200.8	Lead
103.140	012	EPA 200.8	Nickel
103.140	013	EPA 200.8	Selenium
103.140	014	EPA 200.8	Silver
103.140	015	EPA 200.8	Thallium
103.140	016	EPA 200.8	Zinc
103.160	001	EPA 245.1	Mercury
114 - Inorganic Chemistry of Hazardous Waste			
114.010	001	EPA 6010B	Antimony
114.010	002	EPA 6010B	Arsenic
114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium
114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury
116 - Volatile Organic Chemistry of Hazardous Waste			
116.030	001	EPA 8015B	Gasoline-range Organics
116.080	001	EPA 8260B	Acetone
116.080	003	EPA 8260B	Acrolein
116.080	004	EPA 8260B	Acrylonitrile
116.080	007	EPA 8260B	Benzene

As of 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	053	EPA 8260B	Ethylbenzene
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total

As of 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	007	EPA 8270C	Aniline
117.110	008	EPA 8270C	Anthracene
117.110	010	EPA 8270C	Benzidine
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene
117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	Bis(2-chloroethoxy)methane
117.110	021	EPA 8270C	Bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	023	EPA 8270C	Di(2-ethylhexyl) Phthalate
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	031	EPA 8270C	4-Chlorophenyl Phenyl Ether
117.110	032	EPA 8270C	Chrysene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	064	EPA 8270C	1,2-Diphenylhydrazine
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene
117.110	072	EPA 8270C	Hexachloroethane

117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	083	EPA 8270C	2-Methylnaphthalene
117.110	084	EPA 8270C	2-Methylphenol
117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitrosodi-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	110	EPA 8270C	Pentachlorophenol
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol
117.110	119	EPA 8270C	Pyrene
117.110	120	EPA 8270C	Pyridine
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC
117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	007	EPA 8081A	a-Chlordane
117.210	008	EPA 8081A	g-Chlordane
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221

117.220	003	EPA 8082	PCB-1232
117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260

As of 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

California Department of Health Services

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

ADVANCED TECHNOLOGY LABORATORIES

3275 WALNUT AVENUE

SIGNAL HILL, CA 90755

Scope of certification is limited to the
"List of Approved Fields of Testing and Analytes"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No:	1838
Expiration Date:	12/31/2004
Effective Date:	12/01/2002

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES .
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

ADVANCED TECHNOLOGY LABORATORIES
3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Lab Phone (562) 989-4045

Certificate No: 1838 Renew Date: 12/31/2004

Field of Testing: 02 - Inorganic Chemistry and Physical Properties of Drinking Water		
02.01	00	Alkalinity
02.02	00	Calcium
02.03	00	Chloride
02.05	00	Fluoride
02.06	00	Hardness
02.07	00	Magnesium
02.08	00	MBAS
02.09	00	Nitrate
02.10	00	Nitrite
02.11	00	Sodium
02.12	00	Sulfate
02.13A	00	Total Dissolved Solids
02.13B	00	Conductivity
02.16	00	Phosphate, Ortho
02.17	00	Silica
02.18	00	Cyanide
02.19	00	Potassium
02.24	00	Perchlorate
02.24	00	Perchlorate
02.25	00	Combined & Total Chlorine
02.27	00	Chlorine Dioxide
02.29	00	Total Organic Carbon

Field of Testing: 03 - Analysis of Toxic Chemical Elements in Drinking Water		
03.01	00	Arsenic
03.02	00	Barium
03.03	00	Cadmium
03.04	00	Chromium, Total
03.05	00	Copper
03.06	00	Iron
03.07	00	Lead
03.08	00	Manganese
03.09	00	Mercury
03.10	00	Selenium
03.11	00	Silver
03.12	00	Zinc
03.13	00	Aluminum
03.15	00	Antimony
03.16	00	Beryllium
03.17	00	Nickel
03.18	00	Thallium
03.20	00	Boron
03.21	00	Vanadium

Field of Testing: 09 - Physical Properties Testing of Hazardous Waste		
09.01	00	Ignitability

As of 12/30/2003 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

09.02	00	Corrosivity - pH Determination	
09.04	00	Reactivity	Section 7.3 SW-846
Field of Testing: 10 - Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste			
10.01	00	Antimony	
10.02	00	Arsenic	
10.03	00	Barium	
10.04	00	Beryllium	
10.05	00	Cadmium	
10.06	00	Chromium, Total	
10.07	00	Cobalt	
10.08	00	Copper	
10.09	00	Lead	
10.10	00	Mercury	
10.11	00	Molybdenum	
10.12	00	Nickel	
10.13	00	Selenium	
10.14	00	Silver	
10.15	00	Thallium	
10.16	00	Vanadium	
10.17	00	Zinc	
10.18	00	Chromium (VI)	
10.19	00	Cyanide	
10.20	00	Fluoride	
10.21	00	Sulfide	
Field of Testing: 11 - Extraction Tests of Hazardous Waste			
11.01	01	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
11.03	01	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
Field of Testing: 12 - Organic Chemistry of Hazardous Waste by GC/MS			
12.03A	01	Extractable Organics	EPA 8270C
12.06A	01	Volatile Organic Compounds	EPA 8260B
12.06B	01	Oxygenates	EPA 8260B
Field of Testing: 13 - Organic Chemistry of Hazardous Waste (excluding GC/MS)			
13.02A	01	Ethanol and Methanol	EPA 8015B
13.15	01	Total Petroleum Hydrocarbons - Gasoline	LUFT
13.16	01	Total Petroleum Hydrocarbons - Diesel	LUFT
13.17	01	TRPH Screening	EPA 418.1
13.19C	01	BTEX	EPA 8021B
13.24C	01	PCBs	EPA 8082
13.25C	01	Organochlorine Pesticides	EPA 8081A
Field of Testing: 16 - Wastewater Inorganic Chemistry, Nutrients and Demand			
16.01	00	Acidity	
16.02	00	Alkalinity	
16.03	00	Ammonia	
16.04	00	Biochemical Oxygen Demand	
16.05	00	Boron	
16.06	00	Bromide	
16.07	00	Calcium	
16.08	00	Carbonaceous BOD	
16.09	00	Chemical Oxygen Demand	
16.10	00	Chloride	
16.11	00	Chlorine Residual, Total	
16.12	00	Cyanide	

As of 12/30/2003, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

16.13	00	Cyanide, amenable	
16.14	00	Fluoride	
16.15	00	Hardness - Total as CaCO3	
16.16	00	Kjeldahl Nitrogen	
16.17	00	Magnesium	
16.18	00	Nitrate	
16.19	00	Nitrite	
16.20	00	Oil and Grease	
16.20	03	Oil and Grease	EPA 1664
16.21	00	Total Organic Carbon	
16.22	00	Oxygen,dissolved	
16.23	00	pH	
16.24	00	Phenols	
16.25	00	Phosphate, Ortho	
16.26	00	Phosphorus, Total	
16.27	00	Potassium	
16.28	00	Residue, Total	
16.29	00	Residue, Filterable	
16.30	00	Residue, Non-filterable	
16.31	00	Residue, Settleable	
16.32	00	Residue, Volatile	
16.34	00	Sodium	
16.35	00	Conductivity	
16.36	00	Sulfate	
16.37	00	Sulfide	
16.39	00	Surfactants	
16.41	00	Turbidity	
16.45	00	Total Organic Halides	

Field of Testing: 17 - Toxic Chemical Elements in Wastewater

17.01	00	Aluminum
17.02	00	Antimony
17.03	00	Arsenic
17.04	00	Barium
17.05	00	Beryllium
17.06	00	Cadmium
17.07	00	Chromium (VI)
17.08	00	Chromium, Total
17.09	00	Cobalt
17.10	00	Copper
17.13	00	Iron
17.14	00	Lead
17.15	00	Manganese
17.16	00	Mercury
17.17	00	Molybdenum
17.18	00	Nickel
17.24	00	Selenium
17.25	00	Silver
17.27	00	Thallium
17.28	00	Tin
17.29	00	Titanium
17.30	00	Vanadium
17.31	00	Zinc

Field of Testing: 18 - Organic Chemistry of Wastewater by GC/MS

18.01	01	All Volatile Organics	EPA 624
18.02	01	All Acid/base/neutral Compounds	EPA 625
Field of Testing: 19 - Organic Chemistry of Wastewater (excluding GC/MS)			
19.02	01	Aromatic Volatiles	EPA 602
19.08A	01	Organochlorine Pesticides	EPA 608
19.08B	01	PCBs	EPA 608

As of 12/30/2003, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

Appendix I

Fax Cover Page

Advanced Technology
Laboratories

3275 Walnut Avenue
Signal Hill CA 90807
(562) 989-4045 Phone
(562) 989-4040 Fax

Fax Transmittal Sheet

To:

From:

RE:

Message:
